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**RECOVERY OF ZINC FROM
LOW-GRADE AND COMPLEX ORES**

BY

DORSEY A. LYON AND OLIVER C. RALSTON



**WASHINGTON
GOVERNMENT PRINTING OFFICE
1919**

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CONTENTS.

	Page.
Preface.....	9
Introduction.....	11
Zinc ores and concentrates suited to retort smelting.....	11
Zinc losses in mining and milling.....	13
Losses in mining.....	13
Losses in milling.....	13
Hydromechanical processes.....	13
Electromechanical processes.....	15
Magnetic separators.....	15
Electrostatic separators.....	15
Flotation processes.....	16
Zinc recovery by different concentration processes.....	17
Loss of zinc in lead smelting.....	18
Scope of investigations at Salt Lake City station.....	19
Outline of work.....	19
Discussion of work outlined.....	24
Mechanical concentration of zinc sulphide ores.....	24
History of early mining in Park City.....	26
Tailing disposal.....	26
Tailing losses of to-day.....	27
Creek leasing.....	28
Moore Creek leasing mill.....	29
Daly-West mill.....	31
Daly-Judge milling practice.....	32
Slime treatment at the Daly-Judge.....	33
Flotation.....	33
Silver King Coalition milling practice.....	34
Sulphide section.....	35
Costs.....	36
Mills on tailing flats below Park City.....	36
Broadwater mill.....	36
Beggs mill.....	36
Big Four Exploration Co. mill.....	37
Flotation of zinc sulphide ores.....	38
Differential flotation.....	40
Zinc-lead sulphides.....	40
Zinc-iron sulphide mixtures.....	41
Dry concentration processes.....	43
Igneous concentration.....	43
Electrostatic separation.....	44
Magnetic roasting and separation.....	45
Experiments at Salt Lake City station.....	45
Description of roaster and magnetic separator.....	45
Tests of ores.....	46
Zinc-iron middling from Utah-Apex mine, Bingham, Utah....	46
Ores from the Consolidated Nevada-Utah and the Green-wood mines, Pioche, Nev.....	47
Zinc-iron middling from Broadwater mill, near Park City, Utah.....	49
Ore from Carlyle mine, Steeplerock, N. Mex.....	49
Ores from mines near Chloride, Ariz.....	51
Summary of the magnetic-separation tests.....	53

	Page.
Roasting zinc sulphide ores.....	53
Chloridizing roasting.....	53
Oxide roasting.....	54
Sulphate roasting.....	55
Roasting of a low-iron ore from Daly-Judge mine.....	56
Description of ore and of method used.....	56
Discussion of results of tests.....	57
Leaching the calcine.....	59
Roasting of a high-iron ore from Honorine mine.....	59
Effects of temperature and time of roasting.....	60
Effects of fineness of grinding.....	61
Experiments to determine the effects of lead.....	62
Leaching the calcined ore.....	64
General method used in tests.....	64
Tests of ore from Daly-Judge mine.....	64
Tests of ore from Bullion Coalition mine.....	68
Effects of roasting with sodium chloride.....	68
Treatment of low-lead mill products.....	68
Tests of marmatite ore from Wasa mine.....	72
Tests of partly oxidized ores.....	73
Ore from Lower Mammoth mine.....	73
Marmatite ore from Wasa mine.....	78
Magnetic roasting.....	79
Hydrometallurgy of zinc sulphide ores.....	79
Sulphate processes.....	80
Sulphite processes.....	81
Difficulties of applying process.....	81
Experiments.....	82
Leaching agents.....	84
Hydrochloric acid.....	84
Hydro-fluosilicic acid.....	85
Caustic soda.....	85
Ammoniacal solutions.....	85
Leaching iron from zinc-iron sulphides.....	86
Description and results of tests.....	86
Precipitation of zinc solutions.....	88
Electrolytic deposition.....	88
Chemical precipitation.....	88
Ammoniacal solutions.....	88
Caustic alkali solutions.....	89
Sulphate solutions.....	89
Precipitation of zinc sulphate solutions with calcium chloride.....	90
Precipitation of zinc chloride with lime.....	91
Tests with pure zinc chloride.....	91
Experiment with oxidized zinc ore.....	92
Removal of manganese.....	94
Use of chloride of lime in moderate amounts.....	94
Use of larger amounts of chloride of lime.....	95
Use of zinc chloride solution.....	95
Tests with chlorine water.....	96
Tests with chlorine gas.....	97
Bisulphite solutions.....	100
Summary.....	101

	Page.
Oxidized zinc ores.....	102
Introduction.....	102
Concentration processes.....	102
Gravity concentration.....	102
Flotation.....	103
Magnetic separation of limonite and oxidized zinc minerals.....	103
Calcining oxidized zinc ores.....	105
Igneous concentration.....	106
Wetherill grate furnace.....	106
Special roasting processes for oxidized zinc ores.....	120
Hydrometallurgy of oxidized zinc ores.....	120
Acid efficiency.....	121
Leaches with weak acid solutions.....	121
Leaches with increasing strengths of acid solution.....	123
Leaching agents.....	124
Sulphuric acid.....	124
Hydrochloric acid.....	129
Sulphurous acid.....	130
Hydrofluosilicic acid.....	131
Alkaline agents.....	132
Caustic soda.....	132
Ammonia.....	133
Purification and precipitation of solutions.....	134
Summary of hydrometallurgy of oxidized zinc ores.....	137
Publications on metallurgy.....	138
Publications available for free distribution.....	138
Publications that may be obtained only through the Superintendent of Documents.....	139
Index.....	141

TABLES.

TABLE 1. Production of spelter in the United States in 1914.....	12
2. Recovery of zinc by various concentration processes.....	18
3. Analyses of oxidized and semioxidized zinc ores.....	21
4. Analyses of complex zinc-sulphide ores and concentrates.....	22
5. Names of shippers from Park City district during 1915, with tonnage and products shipped.....	25
6. Mill tests at the Daly-Judge mill.....	33
7. Results of magnetic separation of Utah-Apex zinc-iron middling..	47
8. Results of magnetic separation of ore from Consolidated Nevada-Utah mine.....	48
9. Results of magnetic separation of ore from Greenwood lease.....	48
10. Results of magnetic concentration of zinc middling from the Broadwater mill.....	49
11. Results of magnetic separation of ore from Carlyle mine, roasting without tabling.....	50
12. Results of magnetic separation of ore from Carlyle mine, with tabling.....	50

	Page
TABLE 13. Results of magnetic separation of ore from C. O. D. mine near Chloride, Ariz.....	51
14. Results of concentration tests of ore from Middle Golconda mine....	52
15. Results of analyses of zinc-lead sulphide ores.....	63
16. Results of leaching Daly-Judge calcines.....	65
17. Results of leaching calcines from the roasting of Bullion Coalition No. 5 ore.....	66
18. Results of leaching calcines from chloridizing roast of Bullion Coalition No. 5 ore.....	67
19. Results of analyses of four zinc products low in lead.....	69
20. Results of screen analyses of zinc ores and concentrates low in lead..	69
21. Leaching zinc blende from Joplin, Mo., after roasting.....	70
22. Results of leaching zinc-blende concentrate and zinc-iron middling from Midvale, Utah, after roasting.....	71
23. Results of leaching ore from Wasa mine after roasting at 750° C. for 4 hours.....	72
24. Results of screen analysis of partly oxidized ores from Lower Mammoth mine after roasting.....	73
25. Results of roasting and leaching partly oxidized zinc ore, Lower Mammoth No. 1.....	73
26. Roasting and leaching partly oxidized zinc ore, Lower Mammoth No. 2.....	74
27. Results of roasting and sulphuric acid leaching, ore from Wasa mine..	76
28. Precipitation of sulphates from zinc sulphate solutions with calcium chloride.....	90
29. Precipitation of zinc chloride solutions with lime.....	91
30. Results of treating zinc-sulphate leaching solutions with lime compounds.....	93
31. Results of treating zinc sulphate solutions with lime compounds for removal of manganese.....	94
32. Results of treating zinc sulphate solutions with excess CaOCl_2 to remove manganese.....	95
33. Results of treating zinc hydroxide precipitate with zinc chloride solution to remove lime.....	95
34. Results of treating zinc sulphate solutions with chlorine to oxidize manganese.....	97
35. Results of cyclic leaching and precipitation tests.....	99
36. Results of calcining oxidized zinc ores.....	106
37. Results of igneous concentration of oxidized zinc ore in a small blast furnace.....	109
38. Results of igneous concentration of low-grade sulphide ores of lead and zinc in a small blast furnace.....	110
39. Costs and profits of a 25-ton zinc oxide plant.....	116
40. Costs and profits of a 50-ton zinc oxide plant.....	118
41. Compositions of oxidized zinc ores used in leaching tests with sulphuric acid.....	125
42. Results of trial leaches on 1-gram samples of oxidized ores.....	125
43. Results of leaching oxidized zinc ores with sulphuric acid, showing zinc recovery and acid efficiency.....	126
44. Results of analyses of neutral solution of zinc sulphate and impurities.....	127
45. Results of sulphurous acid leaching of oxidized zinc ores.....	131
46. Results of leaching oxidized zinc ore with caustic soda solution....	133

ILLUSTRATIONS.

FIGURE		Page.
1.	Present source of zinc and also ores not utilized.....	14
2.	Curves showing effect of temperature on speed of roasting, Daly-Judge No. 1 sample.....	57
3.	Curves showing effects of leaching with different solvents, Daly-Judge No. 1 sample.....	58
4.	Curves showing effect of temperature on speed of roasting, Bullion Coalition No. 5 sample.....	60
5.	Curves showing effects of size of ore on speed of roasting, Bullion Coalition No. 5 sample.....	61
6.	Curves showing effects of temperature on solubility of zinc and lead in slime from Horn Silver dump, Frisco, Utah.....	62
7.	Curves showing effects of roasting on solubility of zinc and lead in various ores.....	63
8.	Curves showing effects of roasting on solubility of zinc and iron in semioxidized zinc ore from Lower Mammoth mine.....	75
9.	Curves showing effect of strength of sulphurous acid on velocity of solution of zinc oxide.....	83
10.	Labratory blast furnace used for zinc-oxide experiments.....	108
11.	Curves showing net smelter prices for oxidized zinc ores at Salt Lake City.....	112
12.	Curves showing change in value of zinc oxide concentrate with varying zinc content.....	113
13.	Plan and sections of 25-ton zinc-oxide plant.....	114
14.	Curves showing cost per ton of ore for a 25-ton igneous concentration plant and returns as calculated from "ore" contract.....	116
15.	Curves showing cost per ton of ore for a 25-ton igneous concentration plant and returns as calculated from "zinc oxide" contract.....	117
16.	Curves showing cost per ton of ore for a 50-ton igneous concentration plant and returns based on "ore" contract.....	118
17.	Curves showing cost per ton of ore for a 50-ton igneous concentration plant and returns as calculated from "zinc oxide" contract.....	119
18.	Curves showing efficiency of weak acids in four successive leaches.....	122
19.	Curves showing recovery of zinc in four successive leaches with weak acids.....	122
20.	Curves showing relation of zinc recovery to molecular weights of acids used.....	122
21.	Curves showing effect of different concentrations of sulphuric acid.....	123
22.	Curves showing effects of different concentrations of hydrochloric acid.....	123
23.	Curves for computing acid efficiency when weights of acids consumed and zinc recovered are known.....	124

PREFACE.

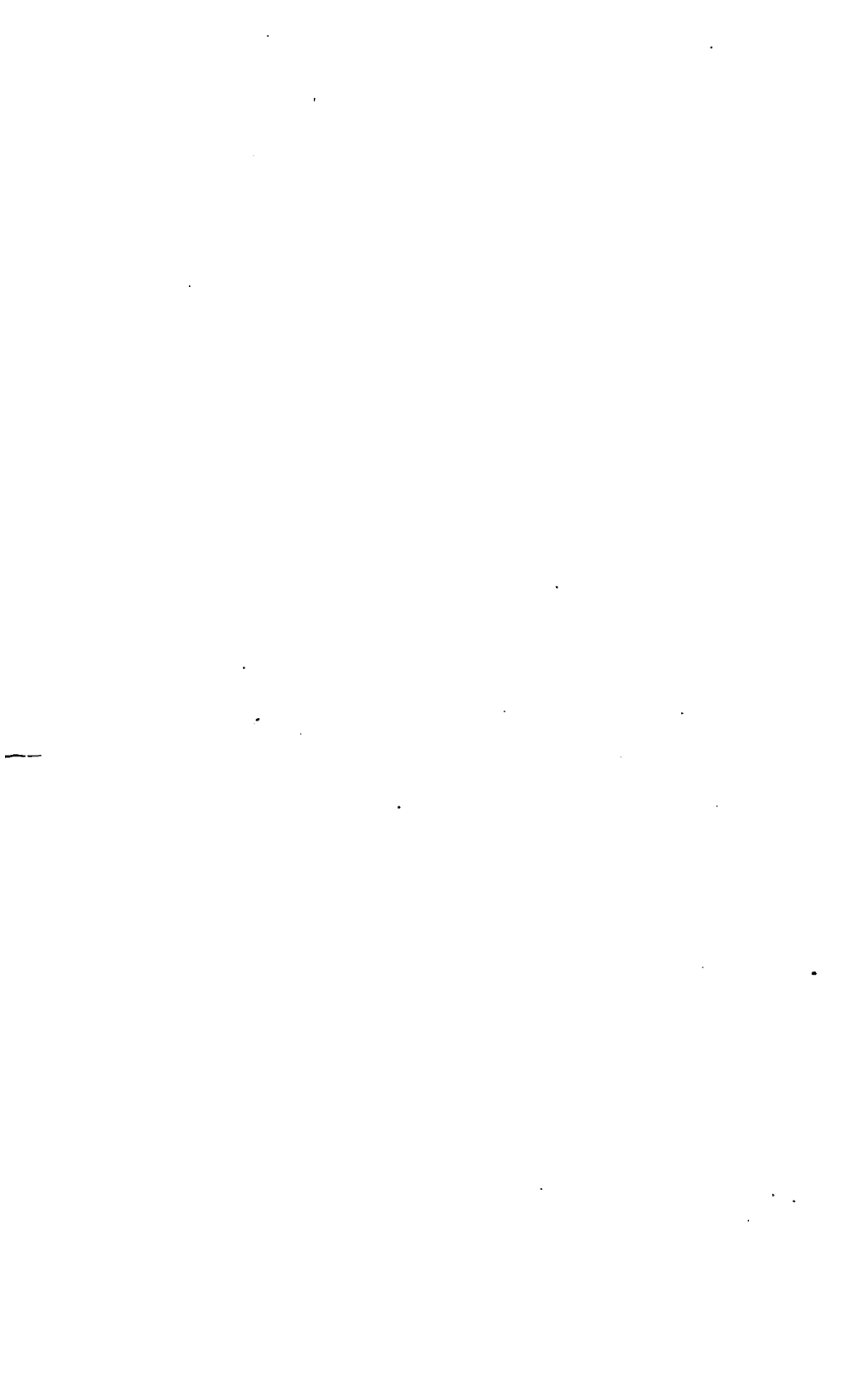
At its tenth regular session in 1913 the Utah Legislature provided for the establishment of a metallurgical research department in connection with the State school of mines of the University of Utah. As stated in the act providing for this department (Laws of Utah, 1913, ch. 102, sec. 2, pp. 199-200), the purposes of this research department have been to conduct experiments and research, either alone or in cooperation with the Federal Bureau of Mines and other agencies, with a view of finding ways and methods of profitably treating low-grade ores, of obtaining other information that shall have for its object the benefit of the mining industry and the utilization and conservation of the mineral resources of the State, and to publish and distribute bulletins and articles relating to the department and its work.

This act became effective in July, 1913. In January, 1914, the university made a working agreement with the Federal Bureau of Mines. By the terms of this agreement the work of the metallurgical research department is under the direction of metallurgists of the Bureau of Mines assigned to duty at the university and Salt Lake City. From January, 1914, to July, 1916, D. A. Lyon, metallurgist, was in charge of the work, assisted by O. C. Ralston and other members of the metallurgical staff of the bureau who were on duty at Salt Lake City.

As a part of the cooperative agreement, the University of Utah provides five metallurgical fellowships. The fellowships are awarded to graduates of colleges, preferably of mining schools, who have shown special aptitude for research investigations. Their employment extends over the entire 12 months.

Aside from O. C. Ralston, the experimenters mentioned in this bulletin in connection with the work were holders of these fellowships. Persons desiring further information regarding the cooperation between the university and the bureau are referred to Bulletin 157, Bureau of Mines, pages 9-11.

VAN. H. MANNING,
Director.



RECOVERY OF ZINC FROM LOW-GRADE AND COMPLEX ORES.

By DORSEY A. LYON and OLIVER C. RALSTON.

INTRODUCTION.

Volatilization in retorts has been, until recently, the only commercial process of producing spelter, hence the zinc mine operators have had to meet the terms of the zinc smelters in regard to the following requirements: (1) Minimum percentage of zinc the ore must contain; (2) the chemical combination of the zinc in the ore; (3) the proportion present of those elements that interfere with the successful recovery of the zinc when the ore is retorted. In consequence of these requirements, only a comparatively small proportion of the zinc ores mined can be shipped directly to the smelters.

ZINC ORES AND CONCENTRATES SUITED TO RETORT SMELTING.

Under normal conditions the low limit of zinc in ores suited to retort smelting is about 25 per cent for oxidized ores and about 35 per cent for sulphide ores. Consequently the ores or products suited to zinc smelting in retorts may be obtained from—

1. Zinc ores free from interfering elements.
2. Concentrates of zinc ores or of zinc-lead ores.
3. Concentrates of mixed and complex ores, containing gold, silver, lead, copper, zinc, etc.

Table 1, compiled from statistics published in the Mineral Resources of the United States for 1914, shows the principal zinc producing States and the kind of ores mined in them. The zinc produced from ore mined in Missouri, Kansas, Illinois, and Wisconsin comes from sulphide (blende), carbonate, and silicate of zinc; in other words, from class 1. The zinc produced in Utah and in Idaho, Montana, Colorado, and Nevada is largely from classes 2 and 3, or lead-zinc ores, the zinc being separated from the lead when the metallic minerals of the ore are separated from the worthless gangue by some form of mechanical concentration.

As stated previously, and as will be shown later, a large part of the valuable mineral content of the ore is lost in effecting this concentration.

As a result of the other requirements that have to be met in zinc smelting, much zinc is lost in the mining and milling of zinc ore.

ZINC LOSSES IN MINING AND MILLING.

LOSSES IN MINING.

In mining the ore the zinc losses aggregate a large tonnage. These losses are due to several causes; for instance, in the average western lead mine the zinc ore remains as a shell around stopes from which the oxidized lead ores have been taken. In most mines the lateral extent of these shells is unknown, and as they generally carry too little metal to warrant mining at present, they are not removed. Later, the lead-ore stopes are filled with waste and the zinc in these surrounding shells is lost. Figure 1^a shows the present sources of zinc and the ores not utilized.

LOSSES IN MILLING.

As only a small proportion of the zinc ores mined in the United States contains enough zinc to warrant direct smelting, separation of the valuable minerals from the gangue by some method of mechanical concentration is generally necessary.

For the sake of convenience, the concentrating processes used are considered herein in the following order:

1. Hydromechanical processes.
2. Electromechanical processes.
 - (a) Electromagnetic,
 - (b) Electrostatic.
3. Flotation processes.

HYDROMECHANICAL PROCESSES.

In treating zinc ores by hydromechanical processes the object is to obtain a concentrate that, if necessary may afterwards be separated into a zinc product and a lead product, or into a zinc product and a product that may contain lead, copper, gold, and silver, and is sent either to a lead or to a copper blast furnace.

As stated previously, a large proportion of the zinc and lead minerals is often lost in the tailing when any ore mined for its zinc or lead content is treated by hydromechanical concentration. As one of the functions of the Federal Bureau of Mines is to conduct investigations looking to the prevention of mineral waste, the bureau

^a Lyon, D. A., and Arentz, S. S., Losses of zinc in mining, milling and smelting: Trans. Am. Inst. Min. Eng., vol. 49, 1915, p. 799.

has for some time been conducting investigations in the Wisconsin^a and the Missouri^b zinc fields in order to ascertain the causes of the

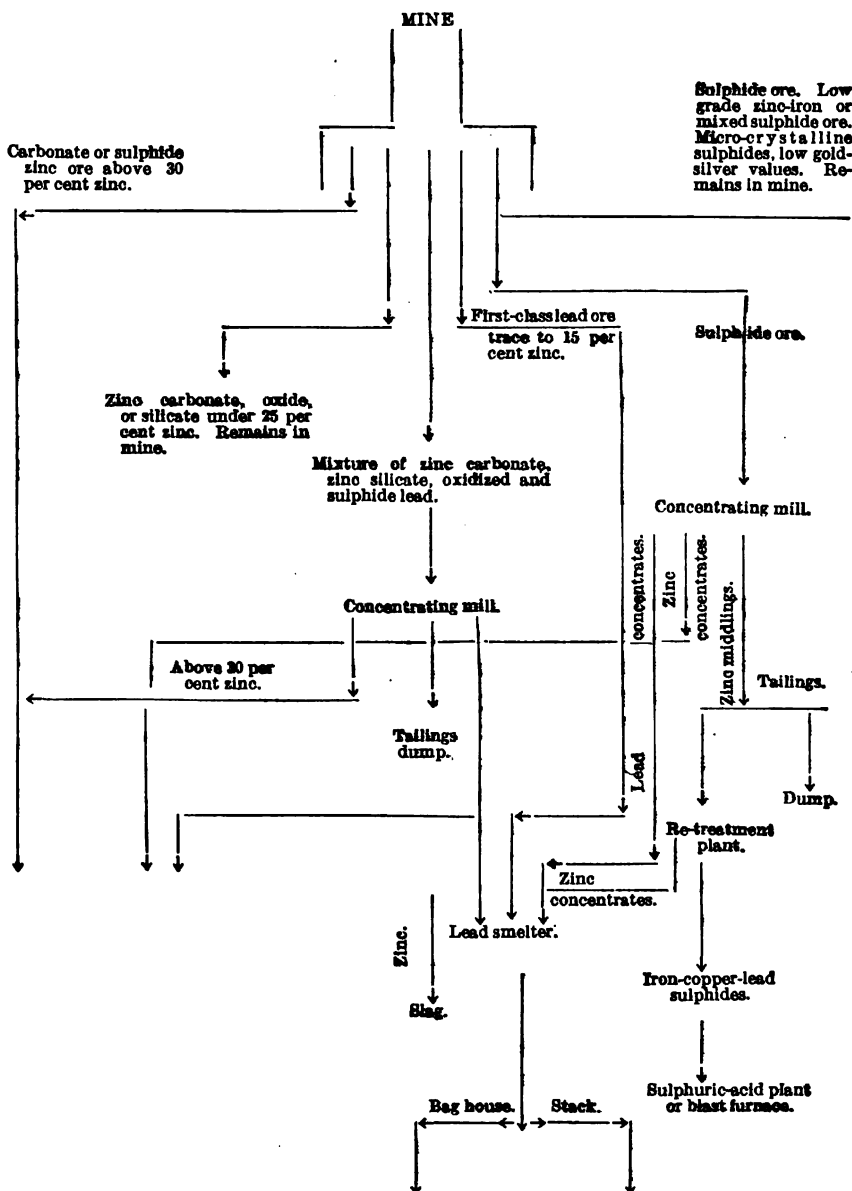


FIGURE 1.—Present source of zinc, and also ores not utilized.

losses in milling zinc ores in those States, and, if possible, to devise improvements in the processes used.

^a Wright, C. A., Mining and milling of lead and zinc ores in the Wisconsin district, Wisconsin: Tech. Paper 95, Bureau of Mines, 1915, 39 pp.

^b Wright, C. A., and Buehler, H. A., Mining and milling of lead and zinc ores in the Missouri-Kansas-Oklahoma zinc district, Bull. 154, Bureau of Mines, 1918, 134 pp.

Wright * gives the following interesting data on the efficiency of hydromechanical concentration in the Joplin district. The ores require the simplest form of hydromechanical concentration.

Efficiency of concentrating methods in the Joplin district.

Quantity of ore through mill, tons.....	309.70
Quantity of zinc concentrate produced, tons.....	9.235
Assay of zinc concentrate, per cent Zn.....	59.
Quantity of blende (ZnS, 67 per cent Zn) in concentrate, tons.....	8.132
Quantity of tailing, tons.....	300.465
Assay of tailing from mill (0.96 per cent Zn) per cent ZnS....	1.43
Loss of blende (ZnS) in tailing, tons.....	4.296
Total quantity of blende (ZnS) in ore through mill, tons.....	12.428
Total recovery of blende through mill, per cent.....	65.43

The average loss, therefore, in the concentration of zinc in the Joplin district is 35 to 40 per cent. There are heavy losses in smelting. The total loss reaches nearly 50 per cent.

ELECTROMECHANICAL PROCESSES

MAGNETIC SEPARATORS.

A magnetic separator contains a set of magnets by which paramagnetic or weakly magnetic minerals brought into the magnetic field are influenced in such a manner as to effect the desired separation. For example, a mixed sulphide ore crushed to the required degree of fineness and passed over a wet-concentrating table yields a galena-pyrite product and a pyrite-blende product. If the latter product be passed over a magnetic concentrator, such as the Wetherill, two products are obtained: (1) A blende product—assaying about 50 per cent zinc, 10 to 12 per cent iron, and 1 per cent lead—which is sold to the zinc smelters; and (2), a pyrite product, containing some lead and about 5 to 7 per cent zinc, which is mixed with the galena-pyrite product from the concentrating tables and is sold to the lead smelters, for whom it is a desirable ore. When this ore is smelted in the lead blast furnace, the zinc is lost in the slag and fume.

ELECTROSTATIC SEPARATORS.

Electrostatic separators are based on the difference in electrical conductivity of different minerals and on the attraction of bodies having opposite electrical charges. Most of the gangue minerals and some of the metallic sulphides, for example, blende, are poor conductors, whereas many metallic sulphides and other minerals are good conductors, as pointed out by Richards: ^b

* Wright, C. A., Mining and treatment of lead and zinc ores in the Joplin district, Missouri, a preliminary report: Tech. Paper 41, Bureau of Mines, 1913, p. 36.

^b Richards, Robert H., Ore dressing, vol. 2, 1909, p. 1542.

If a mixture of good and poor conductors, in a neutral state, be dropped upon a highly charged conducting surface, the good conductors immediately receive a charge similar to that of the surface and are repelled, while the poor conductors are much more loath to receive the charge and therefore not so readily repelled. If, however, a material charged to a high potential of the opposite sign be fed to the above-mentioned surface, the good conductors, as before, assume immediately the condition of the charged surface and are repelled, while the very poor conductors, carrying a charge opposite to that which the surface carries, by the above law, tend to cling to that surface, thus making a sharper division of the separation. Theoretically the separation of two minerals does not require that one of them be a very good conductor and the other a very poor conductor, but merely that there be a difference in the degree to which they will conduct electricity. Commercially, of course, there are limits to this.

At Midvale, Utah, near Salt Lake City, at the plant of the United States Smelting, Refining & Mining Co., an electrostatic concentrating plant has been in operation since 1909, that is said to save 5,000,000 to 7,000,000 pounds of zinc annually which before had gone to waste. Zinc-iron middlings, partly furnished by the company's concentrator, partly from custom ore from the district, are passed over a Huff separator. MacGregor ^a states that the "feed" to the mill assays approximately 0.04 ounce gold, 2.5 ounces silver, 2.5 per cent lead, 1 per cent copper, 23 per cent iron, 28 per cent zinc; the separated zinc product assays 48 to 50 per cent zinc with 3 to 5 per cent iron, and the iron product 10 per cent zinc. Most of the gold, silver, copper, and lead is found in the iron product, and this product is smelted in the company's lead furnaces.

The iron product contained about 10 per cent zinc. The assays of other products, as given by MacGregor, show the same thing; that is, in the "iron product" or the "copper product"—the product that goes to the blast furnace and from which the greater part of the zinc has been separated—there is still anywhere from 8 to 12 per cent zinc, and the zinc in this product is not recovered.

FLOTATION PROCESSES.

In order to concentrate a zinc ore by flotation it is generally necessary to heat the pulp and to use acid. If the ore contains both lead and zinc the minerals carrying these metals are floated, and the lead-bearing minerals must be separated from the zinc-bearing minerals. In order to effect such a separation, Horwood, of Australia, devised a selective or preferential process. The following statement in regard to this process is taken from Metallurgical and Chemical Engineering ^b.

Selective flotation by Horwood's process.—The Broken Hill correspondent of the Australian Mining Standard, January 15, 1914, states that the successful establishment of

^a MacGregor, F. S., Progress in electrostatic ore dressing: Trans. Am. Electrochem. Soc., vol. 24, 1913, p. 352.

^b News item, Selective flotation by Horwood's process: Met. and Chem. Eng., vol. 12, May, 1914, p. 350.

the Horwood process of selective flotation at the works of the Zinc Corporation was one of the metallurgical achievements of 1913. The principle of this process is the roasting of mixed lead-zinc concentrates obtained by flotation, whereby the lead particles are slightly sulphatized while the zinc is unaffected. On floating the roasted product the zinc alone floats and the lead remains submerged.

A plant having a capacity of 500 tons weekly has been in operation for over six months, treating current and accumulated slime concentrates. The slimes are first dewatered and washed to remove soluble salts, then lightly roasted in an Edwards furnace, and finally treated again by flotation. Typical actual results from this plant are as follows:

	Zinc, per cent.	Lead, per cent.	Silver, oz. per ton.
Feed to roaster	40.4	14.6	21.4
Zinc concentrate	48.7	5.2	11.6
Lead residue	10.2	44.2	54.6

The grade of the lead is, of course, dependent on the amount of gangue in the feed.

Tests made on Tasmanian ores show that 85 to 90 per cent of the zinc can be recovered as a concentrate assaying 57 to 58 per cent zinc, while the lead will remain with the iron content of the ore. From 75 to 80 per cent of the silver content of the ore and about 90 per cent of the gold will accompany the lead residue.

Other differential flotation processes that have been more recently developed are mentioned on a later page of this bulletin.

ZINC RECOVERY BY DIFFERENT CONCENTRATION PROCESSES.

Table 2 following shows the average recovery of zinc by various standard concentration processes. Most of the present processes rarely give a clean separation of lead and zinc; the product that goes to the zinc smelter contains considerable lead, and vice versa, the zinc contained in the lead product or the lead in the zinc product being lost. Only the zinc lost in smelting lead concentrates in a blast furnace is considered; the flotation of zinc ores is described in a later chapter.

TABLE 2.—*Recovery of zinc by various concentration processes.*^a

Process.	Zinc in sine con- centrate, per cent.	Zinc in product going to lead- blast furnace, per cent.	Per cent recovered.			Remarks.
			Zn.	Pb.	Ag.	
Ordinary wet concentration:						
Daly West, Park City, Utah.....			50.0	95.0	75-80	
Daly Judge, Park City, Utah.....			66.0	92.0	78.0	
Buffalo Hump Mining Co., Burke, Idaho.....			25.0	90.0	85.0	
Joplin, Mo.....			65.43			
Wetherill magnetic s.....	50.0	5-7				
Huff electrostatic s.....	48-50	10.0				
	41.3	12.6				
	49.3	8.6				
Potter-Delprat s.....			66.2	88.5	50.9	
De Bavy s.....	1910	48.1	11.7			
	1911	48.4	14.2			
	1912	49.2	16.6			
Elmore vacuum s.....		46.0	15.64			
Minerals Separation process.....			85.4	74.8	80.1	
Horwood flotation process.....		48.7	10.2			
Hyde flotation process at Butte and Superior.....			{ 88.1 86.4	{ 62.5	{ 83.4 80.0	} For 1913.

^a Lyon, D. A., and Arents, S. S., Losses of zinc in mining, milling, and smelting: Trans. Am. Inst. Min. Eng., vol. 49, 1915, p. 799.

^b Engineering and Mining Journal, Magnetic separation of zinc blends at Denver, Colo., vol. 74, Aug. 26, 1902, p. 217.

^c MacGregor, F. S., Progress in electrostatic ore dressing: Trans. Am. Electrochem. Soc., vol. 24, 1912, p. 352.

^d Hoover, T. J., Concentrating ores by flotation, London, 1912, pp. 61, 97, 105.

LOSS OF ZINC IN LEAD SMELTING.

In smelting a zincky lead concentrate in a blast furnace the metallurgist seeks to get rid of the zinc either by fluxing it with the slag or by volatilizing it as fume, and this zinc is lost. Not only does the miner receive no return for any zinc in the lead concentrates he sends to the smelter, but he is penalized if the proportion of zinc is more than 8 to 10 per cent, because the presence of a larger percentage of zinc causes serious irregularities in the working of the lead furnace and decidedly increases the cost of smelting the ore, more coke being required per ton of ore smelted and the lead-producing capacity of the furnace being lowered. As Anderson ^a has pointed out, it is impossible to express in writing the difficulties met in attempting to smelt zincky ores.

To illustrate the amount of zinc lost in this country in smelting zincky lead ores, the following example ^b will serve:

A concentrate containing, say, 28 per cent of zinc is separated into two products, one containing, say, 50 per cent zinc and the other containing most of the gold, silver, copper, and lead, and about 10 per cent zinc. Then of the original 50 tons of concentrate

^a Anderson, L. D., Some methods of recovering zinc from its ores: Utah Soc. Eng., Salt Lake City, Utah, May, 1916.

^b Lyon, D. A., and Arents, S. S., Losses of zinc in mining, milling, and smelting: Trans. Am. Inst. Min. Eng., vol. 49, 1915, p. 798.

there will be 28 tons (more or less, according to the percentage of iron present) of product containing 50 per cent zinc, and 22 tons containing 10 per cent, and in addition most of the gold, silver, copper, and lead. This product goes to the blast furnace, where ordinarily the zinc content is not saved but is lost in the fume and slag. If the daily tonnage treated is only 50 tons, the annual loss of zinc is almost 1,500,000 pounds. Moreover, this zinc is lost for all time; as it can not be recovered. Evidently the amount of zinc lost in this way aggregates thousands of tons annually. As Clevenger and others have indicated, the inability to recover this zinc constitutes one of the greatest weaknesses of present metallurgical practice, for the zinc so lost represents a distinct economic waste. In the prevention of this waste lies one of the sources from which in the future will be obtained a large part of our zinc supply. The same considerations, of course, hold true to some degree for lead, for any lead present in ores smelted in a copper blast furnace is volatilized and lost.

These facts are not to be considered as an indictment of electro-mechanical methods of concentration or of modern methods of copper and lead smelting; rather they are presented to emphasize the fact that although mechanical concentration and modern methods of smelting have reached a high stage of development, their use entails a great loss of zinc, and that in the future it will quite probably be necessary to stop these wastes in order to increase the available supply of zinc.

From the foregoing brief discussion of the subject the reader will note that certain zinc ores have not been treated for the recovery of the zinc because of the requirements of smelting in retorts, and these same requirements are indirectly responsible for the present losses in the mining of many zinc ores.

SCOPE OF INVESTIGATIONS AT SALT LAKE CITY STATION.

OUTLINE OF WORK.

As one of the functions of the Federal Bureau of Mines is to conduct investigations looking to the prevention of mineral waste, and as the research work being done by the Salt Lake City station of the Bureau of Mines, in cooperation with the department of metallurgical research of the State School of Mines of the University of Utah, is to gather and distribute such information as will make possible the treatment of low-grade and complex ores not now being treated, the problem of treating such zinc ores and the prevention of zinc waste was one of the first problems undertaken by the station.

In 1914 a preliminary survey was made of the State of Utah in order to ascertain the nature and extent of the various low-grade and complex ore bodies. This survey showed that large bodies of zinc ores in this State have not been treated because of their being too low grade or too complex. Large bodies of similar ores, especially oxidized and semioxidized ores, are in the adjoining States—Nevada, Idaho, and Colorado. Analyses of such ores are shown in Table 3. The complex zinc ores occur mostly as sulphides, and their composition is shown in Table 4.

TABLE 3.—Analyses of oxidized and semioxidized slates.

Mine and sample.	District.	Fe.	CaO.	MgO.	Al ₂ O ₃ .	Zn.	Pb.	Cu.	Insol.	S.	CO ₂ .	Mn.	As.	Au.
Saratton, 1.....	Saratton, Utah.....	Perct. 7.56	Perct. 9.75	Perct. 1.55	Perct. 6.2	Perct. 20.5	Perct. 8.65	Perct. None.	Perct. 15.9	Perct. 0.2	Perct. 15.90	Perct. 0.04	Trace.	Trace.
Saratton, 2.....	do.....	33.0	8.2	4.67	3.3	8.6	.77	None.	10.6	.35	13.19	.05	.28	Trace.
Saratton, 3.....	do.....	18.5	12.4	8.58	2.6	13.2	None.	.1	8.5	.5	23.57	.19	.16	Trace.
Saratton, 5.....	do.....	25.1	14.0	4.52	None.	20.2	1.90	.....	12.4	.....	.....	.....	.....	.....
Lower Mammoth, 1.....	Eureka, Utah.....	11.75	2.3	1.45	5.8	7.8	1.1	Trace.	52.7	6.5	2.13	.83	1.80	.08
Lower Mammoth, 2.....	do.....	4.79	.9	.40	4.5	12.0	.3	.4	59.6	1.6	.....	.27	.3	None.
Lower Mammoth, 3.....	do.....	27.0	2.1	2.10	12.1	10.6	2.3	1.64	19.1	.4	19.1	.72	4.3	.03
May Day, 2.....	do.....	4.2	10.3	Trace.	None.	15.7	.6	None.	31.4	.7	19.84	None.	.3	.28
May Day, 4.....	do.....	2.6	12.2	8.65	.....	20.7	19.9	None.	25.3	.2	.....	1.07	2.78	.10
Bullion Coalition, 4.....	Stockton, Utah.....	15.0	1.1	.....	8.6	29.9	.21	.13	12.5	.92	19.04	.....	.15	Trace.
Bullion Coalition, 13.....	do.....	13.78	2.8	8.7	4.16	20.1	.30	Trace.	1.6	.41	.....	.63	.....	.....
Santaquin King.....	Santaquin, Utah.....	.33	None.	None.	Trace.	45.8	Trace.	Trace.	33.9	.....	.....	.....	.....	.....
Lake View, 104.....	Promontory, Utah.....	.3	16.1	.....	.....	21.9	12.0	None.	9.2	None.	.....	.....	.....	.....
Lake View, 105.....	do.....	.8	19.5	.....	1.53	31.3	1.4	None.	14.0	None.	.....	.....	.....	.....
Lake View, 106.....	do.....	2.6	16.8	.....	4.11	11.8	6.3	None.	7.6	None.	.....	.....	.....	.....
Yellow Pine, 1.....	Goodsprings, Nev.....	1.4	4.6	.....	.....	32.7	14.6	Trace.	7.3	.....	.....	.....	11.04	Trace.
Western Mining Co.....	Leadville, Colo.....	19.7	Trace.	.....	3.3	20.1	.05	None.	19.5	.....	.....	.....	.....	.....
Trapper, tailing.....	Melrose, Mont.....	7.0	5.5	3.62	Trace.	11.3	2.58	.64	54.0	.30	.....	.02	8.7	.065
Nevada Zinc Co.....	Tobar, Nev.....	5.3	17.35	10.75	.37	13.1	None.	.....	13.3	.24	.....	.15	.....	.....
Yellow Pine, 2.....	Goodsprings, Nev.....	3.7	12.7	10.5	.32	18.5	4.70	.24	11.15	.21	.....	.08	2.5	.02
Yellow Pine, 3.....	do.....	2.9	12.8	8.3	.37	19.3	3.12	None.	22.0	.25	.....	.05	3.7	None.
Yellow Pine, 4.....	do.....	2.7	6.8	5.5	.28	29.3	9.33	None.	14.8	.31	.....	.02	3.9	None.
Fredericksen, 1.....	do.....	2.0	10.5	7.2	.19	12.2	5.85	None.	36.6	.30	.....	.09	10.76	None.
Fredericksen, 2.....	do.....	2.0	1.2	Trace.	.22	13.8	7.51	.03	64.5	.14	.....	.005	.....	None.
Monte Christo.....	do.....	2.0	6.3	3.9	.19	22.1	None.	None.	48.2	.21	.....	.05	1.50	None.
Moscow, 4.....	Beaver County, Utah.....	7.5	5.1	3.8	3.41	20.6	.76	.49	29.8	.24	.....	.....	1.42	Trace.
Cedar Talkman, 2.....	do.....	3.4	2.3	2.7	1.56	25.7	2.85	.05	51.4	.14	.....	.....	2.36	Trace.

The work reported in this bulletin is outlined by the table of contents (p. 3). It covers only the concentration of zinc ores and hydrometallurgy of zinc, the smelting of zinc ores not being considered.

The zinc ore investigations carried on thus far by the Salt Lake City station are as follows:

SULPHIDE ORES.

A. Mechanical concentration.

1. Ordinary gravity concentration.
2. Flotation processes.
 - (a) Selective flotation.
 - (b) Differential flotation.

B. Roasting for leaching or mechanical separation.

1. Chloridizing roasting.
2. Sulphate roasting.
 - (a) In muffles.
 - (b) In blast pots.
3. Oxidizing roasting.
 - (a) Present commercial work.
 - (b) Work at University of Utah.
4. Magnetic roasting.

C. Leaching processes.

1. Acid solvents.
 - (a) Sulphuric acid.
 - (b) Sulphurous acid.
 - (c) Hydrochloric acid.
 - (d) Hydrofluosilicic acid.
2. Alkaline solvents.
 - (a) Caustic soda.
 - (b) Ammoniacal solutions.

D. Precipitation processes.

1. Electrolytic precipitation.
 - (a) Development, and present status of process.
 - (b) Application to various types of leaching solutions.
 - (c) Zinc dust by electrolytic methods.
2. Chemical precipitation.
 - (a) From sulphate solutions.
 - (b) From sulphurous acid solution.
 - (c) From ammoniacal and alkaline solutions.
 - (d) Miscellaneous methods.

E. Dry processes.

1. Sulphate roasting and leaching.
2. Igneous concentration.
3. Magnetic separation.

OXIDIZED ORES.

A. Mechanical concentrating process.

1. Ordinary milling processes, and why they are not applicable.
2. Flotation processes.
 - (a) Selective flotation.
 - (b) Differential flotation.

- B. Roasting processes.
 - 1. Chloridizing roasting.
 - 2. Sulphate roasting.
- C. Leaching processes.
 - 1. Acid solvents.
 - (a) Sulphuric acid.
 - (b) Sulphurous acid.
 - (c) Hydrochloric acid.
 - (d) Hydrofluosilicic acid.
 - 2. Alkaline solvents.
 - (a) Caustic soda.
 - (b) Ammoniacal solutions.
- D. Precipitation processes.
(Same as for sulphide ores.)
- E. Dry processes.
 - Igneous concentration.

DISCUSSION OF THE WORK OUTLINED.

MECHANICAL CONCENTRATION OF ZINC SULPHIDE ORES.

Most of the zinc recovered from sulphide ores in Utah is from mixtures of lead and zinc sulphides. The usual milling treatment for such ores is to crush, size, or classify the ore, and then separate as cleanly as possible the gangue material from the sulphides with jigs and tables. By this separation of a mixed sulphide ore a lead product and a zinc product are obtained. Sometimes the lead product contains as much as 10 per cent zinc, or even more, as is shown by column 2 of Table 2 (p. 18), and the zinc product contains a considerable quantity of lead.

As previously stated, the zinc that accompanies any lead ore sent to the lead smelter is not recovered, and the problems connected with the milling of a zinc sulphide ore are as follows:

- 1. Effecting a better separation of the lead and zinc minerals.
- 2. Preventing losses of zinc, or of lead and zinc in the tailing.

The Bureau of Mines has studied this problem in Wisconsin^a and in Missouri.^b During the fiscal year 1915-1916 the department of metallurgical research of the Utah school of mines had one "fellow" giving his time to a study of the mining and milling of complex lead and zinc ores in the Park City district, Utah. The results of this investigation were embodied in a report^c to the department, from which the following extract is taken:

Introduction.—The Park City mining district is situated on the eastern slope of the Wasatch Mountains and 25 miles southeast of Salt Lake City, which is west of the mountains.

This district has been a continuous and steady producer of lead-silver ores for 40 years.

^a Wright, C. A., Mining and milling of lead and zinc ores in the Wisconsin district, Wisconsin: Tech. Paper 95, Bureau of Mines, 1915, 39 pp.

^b Wright, C. A., and Buehler, H. A., Mining and milling of lead and zinc ores in the Missouri-Kansas-Oklahoma lead and zinc district: Bull. 154, Bureau of Mines, 1918, 132 pp.

^c Stott, G. F., Mining and milling of complex lead and zinc ores in the Park City district, Utah.

Production.—The total production of the district has been \$156,500,000, of which \$42,000,000 has been paid in dividends. In 1915 the district shipped 99,795 tons of crude ore and concentrates, valued at about \$4,000,000.

*Total production of metals up to January 1, 1915.**

Gold, ounces.....	4, 058, 315
Silver, ounces.....	126, 707, 056
Lead, pounds.....	1, 136, 145, 128
Copper, pounds.....	25, 943, 492
Zinc, pounds.....	48, 081, 726
Total value.....	\$152, 454, 585

In addition to the producing mines there are several properties which are now doing development work * * * outside the producing area, and without doubt some of these will become producers. Present (war) prices of metals have so stimulated production that, if it continues for another year at the present rate, this district will have produced more metals than in any other year of its history.

The names of the shippers from the Park City district during the year 1915 are given in Table 5 following, with the tonnage and kind of products shipped. This table is compiled from the annual review number of the Salt Lake Mining Review, January 15, 1916:

TABLE 5.—Names of shippers from Park City district during 1915, with tonnage and products shipped.

Name.	Product.	Tons shipped.
Beggs, E. J.....	Pb-Fe and Zn concentrates from mill treating tailings.....	752
Big Four Exploration.....	Pb-Fe and Zn concentrates from mill treating tailings.....	1, 801
Broadwater.....	Pb-Fe and Zn concentrates from mill treating tailings.....	1, 031
Clegg & Co.....	Pb-Fe and Zn concentrates from mill treating tailings.....	236
Daly Mining Co.....	Crude oxidized lead-silver ore from mine.....	702
Daly-Judge Mining Co.....	Crude Pb-Ag ore and Pb-Fe and Zn concentrates from mine and mill.....	25, 295
Daly-West Mining Co.....	Crude Pb-Ag ore from mine and Pb-Fe and Zn concentrates from mill.....	12, 296
Federal Leasing Co.....	Crude Pb-Ag ore from Ontario mine.....	47
Grasselli Chemical Co.....	Zn concentrates from mill retreating Zn middlings from other mills.....	51
Keap, G. A.....	Crude Pb-Ag ore from Ontario lease.....	36
Moore, Chas.....	Pb-Fe and Zn concentrates from mill treating creek tailings.....	424
Mines Operating Co.....	Crude Pb-Ag ore from Ontario mine lease.....	1, 595
Ontario Silver Mining Co.....	Crude Pb-Ag ore from mine.....	3, 249
Silver King Coalition.....	Crude Pb-Ag ore from mine and Pb-Ag-Fe concentrates from mill.....	43, 380
Silver King Consolidated.....	Crude Pb-Ag ore and crude Zn ore from mine.....	10, 853
Thompson-Quincy Mining Co.....	Crude Pb-Ag ore from mine.....	17
Union Lime & Stone Co.....	Lime rock for CaO and for cement manufacture.....	55
Utah Ore Sampling Co.....	Ore; purchasers of crude ore and concentrates.....	413
Western Ore Purchasing Co.....	do.....	491
Total (tons).....		102, 453

Mineral constituents.—The primary minerals are in the form of complex sulphides of lead, silver, zinc, iron, and copper, occurring as galena, sphalerite, and some tetrahedrite and chalcopryrite. Silver minerals are known to exist in pyrite, galena, and sphalerite, but like the gold it is not known in what form it exists. Gangue minerals are quartz and calcite.

Oxidation of the ores has extended to as great as 1,700 feet, but averages between 600 and 800 feet. The oxidation has not been complete, and sulphide and carbonate ores often occur together. Pyrite is largely oxidized to hematite and limonite. Galena has been altered to cerussite and anglesite. Copper has been altered to the carbonates, malachite and azurite. Zinc minerals are usually unaltered.

All of the above minerals are closely associated together. In a few of the ore deposits zinc may be absent, or it may occur in sufficient quantity to warrant shipping direct to zinc smelters without separating it from the lead and iron. This, however,

* Helges, V. C., Gold, silver, copper, lead, and zinc in Utah in 1914, mines report: Mineral Resources 1914, U. S. Geol. Survey, pt. 1, Metals, 1916, p. 742.

is unusual. Whenever the ore contains lead and silver minerals in sufficient quantity it is often sent to the lead smelters as crude ore, thus losing all the zinc, in addition to being penalized for the same.

HISTORY OF EARLY MILLING IN PARK CITY.

As was the case in many western mining camps in the late sixties and early seventies, only the high-grade ore could be hauled 24 miles to the railroad and then freighted to the smelters in Omaha, Nebr. Thus we find in 1874 and 1875 attempts made by the Marsac, McHenry, and Ontario mining companies to crush the ore in small 20-stamp mills and amalgamate the rich silver ores.

In 1879 crude amalgamation gave way to chloridizing roasting and pan amalgamation. The Ontario mill doubled its number of stamps, installed two Stetefeldt furnaces, 24 pans, and 12 settlers, making it one of the largest and best mills of its kind.

In 1880 the Marsac mill was remodeled and equipped for a lixiviation process. It was here that the Russell lixiviation process was developed. Mr. Russell attempted to treat silver ores containing high percentages of lead. The bullion produced was correspondingly high in lead. He found that lead could be separated from a hyposulphite solution by the addition of sodium carbonate without precipitating any copper or silver, thus removing the main difficulty encountered in the treatment of lead-silver ores by the lixiviation process.

The first attempt toward wet concentration was in 1878, when the tailings from the Marsac and Ontario mills were treated on the McKim concentrator—a crude vanner composed of an endless canvas belt on a 5 by 15 foot frame with rollers on the ends.

In 1886 the Crescent Mining Co. built the first wet concentration mill, in which they installed fine-crushing machinery and seven Frue vanners. During the next 10 years most of the larger companies installed wet concentration machinery in the shape of Hartz jigs and Frue vanners.

Modern wet concentration in the Park City districts began with the installation of the Wilfley table in the Daly West mill in 1895. Wet concentration to this date had been entirely on Hartz jigs and vanners.

Zinc was discarded as a waste product until 1907, when the Daly Judge mill began saving zinc middlings for treatment in the Grasselli Chemical Co. mill. Only one other attempt had been made to save the zinc. This was in 1902, when the Park City Metals Co. remodeled the old Peck concentrator and installed six Wilfley tables, a Nowell-Hoyt roaster, and a magnetic separator. The mill burned in 1903 and was never rebuilt.

TAILING DISPOSAL.

Tailings from all of these mills are sluiced into the creek and are carried down below the town of Park City, where they have been caught by dams placed in the creek in 1880 by the Ontario Mining Co. The farmers on the flats 10 and 12 miles below Park City objected to having these tailings on their land, so they forced the Ontario Mining Co. to put in seven of these dams on the various flats above them.

These flats are now being worked over for the zinc minerals they contain. Some idea of the vast tonnage which has been milled and the large amount of lead, silver, and zinc minerals that have been discarded as tailings from the early and even the more modern mills may be obtained from samples and data taken at plants now operating on three of the largest flats, namely:

1. Broadwater mill, 2 miles below the town of Park City, 450,000 tons, averaging 1 per cent Pb, 4 per cent Zn, and 4-5 ounces Ag per ton.

	Per ton.
Lead, at 4½ cents.....	\$0. 90
Zinc, at 5.8 cents.....	4. 64
Silver, at 58 cents.....	2. 61
Total	8. 15

\$8.15×450,000=\$3,668,000, total value in minerals.

2. Beggs mill, one-half mile below the Broadwater mill: Deposit 2,500 feet long, 200 feet wide, and 4½ feet deep; 250,000 tons, assaying about the same as the Broadwater; total value of minerals, \$2,018,000.

3. Big Four mill, 7 miles below Park City; deposit 3½ miles long, 500 feet wide, and 2 feet deep; total tonnage available estimated over 1,000,000 tons.

1.8 per cent Pb, 4.1 per cent Zn, 3.1 ounces Ag, Au 30 cents, 2½ per cent Fe, 62 per cent SiO₂.

	Per ton.
Lead, at 4½ cents.....	\$1. 61
Zinc, at 5.8 cents.....	4. 75
Silver, at 58 cents.....	1. 80
Gold.....	. 30
Total.....	8. 46

$8.46 \times 1,000,000 = \$8,460,000$, total value in minerals.

Other small flats will bring the total up to over 2,000,000 tons of tailings worth \$8 per ton, or \$16,000,000, of which a recovery of about 60 per cent of the total mineral values may be expected.

TAILING LOSSES OF TO-DAY.

Even to-day with modern improvements and up-to-date milling practice the zinc losses are extremely large.

At the Daly West mill the "general tails" assayed for six months ending November 1, 1915, 1 per cent Pb, 3.05 per cent Zn, 2.04 ounces Ag, during which time an average of 146 tons per day were treated or approximately 21,900 tons.

	Per ton.
Lead, at 4½ cents.....	\$0. 90
Zinc, at 5.8 cents.....	2. 28
Silver, at 58 cents.....	1. 18
Total.....	4. 46

Economic loss, \$433 per day or approximately \$65,000 in a period of six months.

For the month of September, 1915, 1 per cent Pb, 2.36 per cent Zn, 2.28 ounces Ag, during which time 3,547 tons were treated or 154 tons per day.

	Per ton.
Lead, at 4½ cents.....	\$0. 90
Zinc, at 5.8 cents.....	2. 74
Silver, at 58 cents.....	1. 32
Total.....	4. 96

Loss, \$482.5 per day or \$11,700 total.

For the month of October, 1915, 1 per cent Pb, 3.1 per cent Zn, 2.67 ounces Ag. Tonnage milled was small, being only 1,381 or 125.6 tons per shift worked.

Owing to the shortage of water, the mill was operated every other day.

	Per ton.
Lead, at 4½ cents.....	\$0. 90
Zinc, at 5.8 cents.....	3. 60
Silver, at 58 cents.....	1. 55
Total.....	6. 05

Loss, \$507 per day or \$5,570 total.

Sample taken by Stott, November 3, 1915, 0.88 per cent Pb, 2.46 per cent Zn, 1.8 ounces Ag, 4.33 per cent Fe, 79.9 per cent insoluble:

	Per ton.
Lead, at 4½ cents.....	\$0. 79
Zinc, at 5.8 cents.....	2. 85
Silver, at 58 cents.....	1. 04
Total.....	4. 68

At the Daly Judge mill the mill tailing assayed, before the installation of the flotation process, 1 per cent Pb, 3 per cent Zn, and 2.6 ounces Ag. The average tonnage for the year 1914 was 118 tons per day and a total of 49,095 dry tons milled.

	Per ton.
Lead, at 4½ cents.....	\$0. 90
Zinc, at 5.8 cents.....	3. 48
Silver, at 58 cents.....	1. 51
Total.....	5. 89

Loss per day (78 tons)=\$459.

Loss per year=\$191,300.

At the Silver King Coalition the mill tailings assay as follows: General mill tailing from sulphide ores, 0.7 per cent Pb (fire assay), 2.8 ounces Ag, 2.6 per cent Fe (Jan. 10-12, 1916).

	Per ton.
Lead, at 4½ cents.....	\$0. 63
Silver, at 58 cents.....	1. 33
Total.....	1. 96

General mill tailing from oxide ores, 3.64 per cent Pb., 4.5 ounces Ag.

	Per ton.
Lead, at 4½ cents.....	\$2. 36
Silver, at 58 cents.....	2. 61
Total.....	4. 97

CREEK LEASING.

The above figures represent the material that is daily being sluiced into the creek as tailing. As a result we find to-day two small leasing mills immediately below each of these larger mills. There have been as many as 10 plants operating on the creek in series but they have been forced to quit on account of the mills above improving their extraction within the last year or two. The two surviving mills have been fairly well designed and are better equipped to handle the poorer grade of tailing.

A good insight into the past milling practice was obtained from Mr. Charles Moore, the owner of the two surviving "Creek mills."

In 1900 leasers placed sluice boxes with riffles in the creek. A fair shipping concentrate was obtained. The next step consisted of plank riffles across the creek. Crude concentrates were shoveled into a wagon and hauled down to a rather crude mill consisting of one Wilfley table. With one man and a team and another man operating the Wilfley table the leasers were able to make as high as \$50 a day and averaged \$30 apiece. Thus we can get some idea of how we can to-day go 7 miles below town and find 2,000,000 tons of tailing deposits worth \$8 per ton.

Up to the last three or four years the tailing from the creek assayed 3 per cent Pb, 7 per cent Zn, and about 10 ounces Ag, indicating that the Daly West and Daly Judge mills were not extracting more than 50 to 60 per cent of the lead, 20 to 30 per cent of the zinc, and 35 to 40 per cent of the silver unless the heading to the mills was considerably higher in metallic values than it is at the present time.

MOORE CREEK LEASING MILL.

This mill built by Mr. Charles Moore at a cost of about \$8,000 is a result of 14 years' experience at "creek leasings."

One special feature to be noticed in this mill is the manner of classification of the sands and the entire absence of crushing machinery.

Total average heading to this mill is about 275 tons of solids per day, assaying 1 per cent Pb, 2 ounces Ag, and 2.5 to 3 per cent Zn. Fifty per cent of this amount is removed as oversize at the first trommel and first screen; 15 per cent of the total is slime overflow and is lost on the water wheel.

Water in the creek averages about 1,500 gallons per minute for the year. During the early spring it is impossible to settle any slime on account of heavy flow of water from the melting snows. This lasts for four or five weeks. From the first of March until the first of August there is enough water in the creek to furnish power for running the mill. At other times it is necessary to run a 7-horsepower motor in addition to the water wheel, both of which are belted to a common line shaft, which drives all the machinery in the mill.

A small dam, 2 feet high, catches the creek water and diverts it into a 12-inch by 13-inch launder. At the mill there is a one-half-inch screen set in the launder at about 45° to the direction of the flow, and this removes all one-half-inch oversize without allowing it to settle in the tanks.

Large settling tanks check the velocity of the water and act as classifiers. The first settling tank is 19 feet by 19 feet by 7 feet high. Nearly all of the material which is coarser than one-half inch is caught in the first two compartments of this settling tank. The first two compartments discharge into the trommel screens, and the second two compartments discharge into a box with a one-half-inch screen to catch any oversize and wood chips that might be carried over. From the box the undersize goes into the second settling tank, 10 feet by 12 feet by 6½ feet high, which has three compartments and discharges.

Middlings from each table are shoveled into a hopper and are flushed back to the head of the table for re-treatment. Lead-iron concentrates and the zinc concentrates go into separate boxes at the end of the Wilfley tables, and from there they are shoveled into a wheelbarrow and then to their respective bins. When enough concentrate is stored up to make a shipment it is shoveled into a wagon and hauled to the railroad.

The average output of this mill in 24 hours is 1 ton of zinc concentrates and about one-half ton of lead-iron concentrates. During the year 1914 this mill shipped 400 tons of zinc concentrates and 300 tons of lead-iron concentrates.

Smelter contract calls for:

Payments.

Gold, \$20 for 0.08 or over.

Silver, 95 per cent of the total if over 1 ounce.

Lead, 60 per cent of the lead.

Copper, less 0.75 per cent Cu less 4½ cents per pound.

Iron, 10 cents per unit.

Charges.

Insoluble, 10 cents per unit.

Sulphur, 5 per cent allowed free, excess 25 cents per unit, \$3 maximum.

Zinc, 5 per cent allowed free, excess 20 cents per unit, \$3 maximum.

Spells, 5 per cent allowed free, excess 25 cents per unit.

Base treatment charge: \$2 on a basis of 30 per cent Pb.

Paid 10 cents a unit for all over 30 per cent Pb.

Charges 10 cents a unit for all under 30 per cent Pb.

Thus, for the lead-iron concentrate assaying 20 per cent Pb, 15 per cent Fe, 1.3 per cent Cu, 15 per cent Zn, 25 ounces Ag, 5 per cent SiO_2 , and 25 per cent S, the following would be the smelter returns (normal prices):

Payment.		Charges.	
Lead.....	\$10. 80	Sulphur.....	\$2. 50
Iron.....	1. 00	Zinc.....	2. 00
Copper.....	1. 10	Freight.....	2. 00
Silver.....	13. 78	Sampling.....	. 50
		Hauling to railroad.....	. 50
Total.....	26. 68		
Charges.....	7. 50		7. 50
Net from sale of 1 ton of concentrates.....	19. 18		

Smelter contract with the Iola, Kans., zinc smelter up until the present year paid:

Payment.

Zinc, 80 per cent of zinc on a basis of 35 per cent Zn or better.
Silver, 90 per cent of the silver if 1 ounce or over.

Charges.

Treatment charge, \$15 per ton for 35 per cent Zn or better.
Freight to smelter, \$6.80 per ton to Iola, Kans.

Thus for the zinc concentrate assaying 2 to 3 per cent Pb, 8 per cent Fe, 39 per cent Zn, 0.5 per cent Cu, 13 ounces Ag, and 20-25 per cent S, the following would be the smelter returns, assuming normal prices:

Payment.		Charges.	
Zinc.....	\$36. 20	Smelting.....	\$15. 00
Silver.....	6. 79	Freight.....	6. 80
	42. 99	Sampling.....	. 50
	22. 80	Hauling to railroad.....	. 50
			22. 80
Net from sale of 1 ton of concentrate.....	20. 19		

Costs per day.

Power, \$2 per day for 7½-horsepower motor.....	\$2. 00
Rent of ground on creek, \$50 per month.....	1. 66
Three men operating mill, at \$3.50 per day.....	10. 50
Repairs, heating, and extras.....	. 50

Total cost per day..... 14. 66

Average output of the mill is 1 ton of zinc concentrate and about one-half ton of lead-iron concentrate. From the sale of these concentrates—

Lead-iron concentrate (½ ton)	\$9. 59
Zinc concentrate (1 ton)	20. 19
Total.....	29. 78
Total cost per day.....	14. 66
Profit.....	15. 12

on an investment of \$8,000. If the mill works 300 days a year this represents \$4,536, or 56.6 per cent of the money invested.

DALY WEST MILL.

Ore from the mine is divided into two classes, milling and crude ore, according to the amount and character of the minerals contained. Zinc and silver are the determining factors. For instance, an ore containing over 15 per cent Pb and 20 ounces of Ag is usually shipped as a crude ore; however, if it contains a high percentage of zinc this ore may be sent to the mill in order to separate the zinc from the lead minerals.

A smelter contract with the American Smelting & Refining Co. smelter at Murray calls for a very high base treatment charge and does not penalize for zinc. Therefore this mining company is not very careful to save the lead-zinc ores, especially if they contain high silver values.

Both the crude shipping and the milling ores are complex ores of lead, iron, silver, zinc, and some copper in a gangue of quartz. As the oxidized zone does not extend below the 400-foot level, all of the ores now being shipped are sulphides.

The lead occurs as coarse and granular galena; zinc occurs in various forms, the usual variety is the yellow resinous type of sphalerite; another type is the granular sphalerite (yellow), also resinous but very friable. Pyrite here found exists as small crystals in relatively small amounts. Copper is present only in very small amounts, but is found both as tetrahedrite and chalcopyrite. The silver is found existing in chemical and mechanical combinations with all of the above minerals.

The ore is milled in a plant containing jigs, tables, and flotation machines, the latter being a more recent addition to the plant. Some data on this mill which is of interest is the following:

For the month of May, 1915, the costs for the flotation plant:

Pay roll, \$150; power, \$81.60; supplies, \$15.98. This makes a total cost of \$247.58. Assuming that the plant treated 25 tons per day of 31 days, the cost per ton of dry slime is \$0.313.

For the period of eight months ending November 1, 1915:

	Pb, per cent.	Ag, ounces.
Flotation heading.....	6.36	11.45
Tailing.....	.59	2.84
Concentrate.....	25.80	29.75
Extraction.....	92.45	81.00

For the month of September, 1915:

Flotation heading.....	5.65	11.28
Tailing.....	.44	2.88
Concentrate.....	29.96	42.64
Extraction.....	93.7	79.9

For the month of October, 1915:

Flotation heading.....	9.15	14.84
Tailing.....	.35	2.72
Concentrate.....	24.80	36.52
Extraction.....	97.5	88.0

Test of the flotation efficiency by Stott, Nov. 3, 1915.

	Pb	Zn	Fe	SiO ₂	Ag	Cu
	Per cent.	Per cent.	Per cent.	Per cent.	Oz.	Per cent.
Heading.....	8.2	7.25	5.27	53.64	11.3	0.545
Tailing.....	.55	1.92	3.91	79.64	0.9	0.136
Concentrate.....	15.40	16.26	8.89	24.15	39.0	2.180
Extraction.....	96.5	83.4		20.4	84.8	80.6

• Per cent.

Test made on the Frantz jig efficiency by Stott, Nov. 3, 1916.

	Pb	Zn	Fe	Insoluble	Ag
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Oz.</i>
Heading.....	3.5	4.4	7.1	71.3	5.1
Concentrate.....	50.5	10.1	6.54	3.36	44.35
Tailing.....	0.83	2.46	5.05	78.92	1.0
Extraction.....	78.1	56.6	30.8	12.7	82.6

^a Per cent.

Product to the mill is divided among the following ratios:

	Pb, per cent	Zn, per cent.	Ag, per cent.
Extraction, total of jigs and tables combined.....	84.0	50.0	62.5
Extraction increased by flotation.....	12.	10.8	10.5
Total metallic extraction.....	95.9	60.8	72.5

There is not enough data at hand to calculate the losses after concentration, but from all appearances the results will be rather startling. For instance, an analysis of the concentrates shows:

	Pb, per cent.	Zn, per cent.	Fe, per cent.	Insol., per cent.	Ag, ounces.
Lead-iron concentrate.....	36.42	7.4	13.29	14.15	38.2
Zinc concentrate.....	3.32	37.6	7.65	26.8	33.7

The loss of zinc in the lead concentrate and of lead in the zinc concentrate is a very common loss.

DALY-JUDGE MILLING PRACTICE.

Ore from the mine is divided into two classes, milling and crude ore, according to the amount and character of the minerals contained. Zinc and silver are the determining factors. For instance, an ore containing 12 to 15 per cent lead and less than 10 per cent zinc and 20 ounces of silver is shipped as crude lead ore. If it contains less lead or a higher percentage of zinc it is more profitable to treat in the mill and separate the lead and zinc minerals as far as possible.

Crude and milling ores are complex lead, zinc, iron, copper, and silver ores. These sulphide ores are identical with those found in the Daly-West. Oxidation is limited to the 500-foot level except in fissure deposits where the copper sulphides especially have been altered to carbonate and oxides, yielding azurite, cuprite, and little chrysocolla. The depth of oxidation in the fissures is limited to the 1,200-foot level. Below this point oxidation is not important.

The mill was designed to treat 150 tons of dry ore in eight hours. At the present time the mill is operating two shifts of eight hours each and is treating nearly 200 tons per day.

Milling costs, per ton.

	1914 (49,096 tons treated).	1915 (63,935 tons treated).
Labor.....	\$0.386	\$0.3935
Repairs and maintenance.....	.088	.2230
Supplies.....	.1083	.2063
Assay office.....	.0366	.0293
Fuel and electric power.....	.1150	.1140
Sundries.....	.0381	.0326
Cost per ton.....	.7720	.9986

SLIME TREATMENT AT THE DALY-JUDGE.

Slime treatment in the past has been rather difficult owing to lack of suitable machinery. All the slime prior to November 1, 1915, was treated on Wilfley fine sand tables and Wilfley double deck "slimera."

Average table concentration of slime feed for six months ending June 1, 1915:

TABLE 6.—*Mill tests at the Daly-Judge mill.*

[Previous to oil flotation.]

Material.	Assays.					Total contents.			
	Weights.	Pb	Zn	Ag	Cu	Pb	Zn	Ag	Cu
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Oz. p. ton.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Jig and Pb concentrates.....	14.27	44.80	10.4	40.1	1.45	68.1	14.0	40.9	27.2
Jig and Zn concentrates.....	2.32	6.6	45.0	30.5	2.03	1.6	9.86	5.1	6.2
Jig tailing to tables.....	71.10	3.8	10.9	10.1	.66	23.6	73.1	51.1	63.4
Jig tailing to tailrace.....	12.31	1.2	2.6	3.4	.20	1.6	3.0	3.0	3.2
Heading.....	100.00	9.4	10.6	14.0	.76	100	.....	.....	.....
All table Zn concentrate.....	11.66	2.3	45.0	24.2	1.82	2.8	49.6	20.7	27.9
Pb concentrate, sand and slime tables.....	7.41	22.5	13.0	35.1	2.03	17.7	9.1	18.6	19.8
Pb concentrate, upper slime tables.....	.41	20.5	21.7	37.1	2.25	.9	.8	1.1	1.2
Pb concentrate, basement slime tables.....	.34	26.8	13.0	35.9	2.02	1.0	.4	.9	.9
Pb concentrate, Wilfley slime.....	.09	30.0	6.9	28.2	1.34	.3	.1	.2	.2
Table tailing.....	51.19	1.1	2.7	2.8	0.20	5.9	13.2	10.2	13.5

Recovery, based on content of ore milled.

Silver (Ag).....	per cent..	81
Gold (Au).....	do.....	.....
Lead (Pb).....	do.....	84.6
Copper (Cu).....	do.....	76.1
Zinc (Zn).....	do.....	55.4

Recovery in lead and zinc concentrates.

		In lead concentrates.	In zinc concentrates.
Total Pb recovered.....	per cent..	56.2	1.25
Total Zn recovered.....	do.....	9.7	30.50
Total Ag recovered.....	do.....	35.0	10.80
Total Cu recovered.....	do.....	27.2	15.70

FLOTATION.

Owing to the complex nature of the minerals in the slime feed it has been found impossible to make a differential flotation, but it has been found necessary to float all the sulphides possible and then resort to separation on Wilfley tables. Thus we find a very complicated flow sheet, although flotation ordinarily tends to simplify operations.

A 3-deck Dorr thickener, 30 feet in diameter, takes the slime overflow from the settling tank and three Richards-Janney classifiers. The thickened product contains approximately 15 per cent solids, of which 90 per cent will pass an 80-mesh screen. This seemingly thin pulp meets the flotation requirements to best advantage.

A centrifugal pump elevates the pulp from the thickener to a mixing box, where the oil is added and a second centrifugal pump discharges the pulp into a 20-foot Pachuca tank, 4 feet in diameter, giving further mixing before going to the Callow flotation cells.

The rate of oil feed is regulated by a small plunger pump whose speed can be by means of variable-speed pulleys. The length of stroke can also be manipulated by a lock nut, thus giving a good control of the amount of oil fed per revolution as it is discharged from the first centrifugal pump.

After thorough mixing in the Pachuca tank the pulp is distributed to four roughing cells. The froth is collected and cleaned in the first cleaner cell. Tailing from the first cleaner cell is re-treated in another cell before going to the tailrace.

Tailing from the roughing cells is thickened in Callow cones, and receives further treatment on two Wilfley tables. The product caught on these tables is the lead concentrate, which is not floated. Each table yields lead concentrate, zinc middlings, and tailing. The zinc middlings are re-treated on a separate Wilfley table.

Considerable difficulty is found in breaking up the flotation froth without using much water. A patent nozzle known as the Koerting spray has been found effective in "killing" froth. The froth after passing under the spray is thickened in two Callow cones and the product fed to two Wilfley tables. Each table yields lead-iron concentrate and zinc middlings. The zinc middlings go to a centrifugal pump and are elevated to a third Wilfley table. This table yields zinc concentrate and middlings, which is returned to the head of the table for re-treatment.

This manner of slime treatment yields concentrate having the following analysis:

Results of analysis of slime concentrate.

	SiO ₂ .	Zn.	Pb.	Fe.	Ag.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Ounce</i>
Slime heading to flotation		4.0	2.0	4.0	
Lead-iron concentrate	1.5	7.0	34.0	16.0	34
Zinc concentrate	3.5	46.0	4.5	4.0	34
Apparent extraction		59.5	76.0	.....	63

^a Per cent.

Zinc concentrate is settled in two settling boxes and the product sent to the zinc concentrate bins.

Lead concentrate is thickened in an 8-foot Callow cone before being de-watered in a small settling box, and later taken to the lead-concentrate bins.

SILVER KING COALITION MILLING PRACTICE.

The ore is divided into two classes: First class, crude shipping ore, which contains values in lead and silver to exceed \$17 per ton; second, milling ore which is less than \$17 in value.

The first-class ore is a combination of lead, copper, and iron, with a high silver value, the silver being associated with pyrite and galena. There is more or less sphalerite and copper sulphides associated with the pyrite and the galena, but not in the same amount and extent as is found in Daly-West and Daly-Judge mines.

Ore bodies have been oxidized almost completely to the 900-foot level, and oxidation extends even to the 1,200-foot level. The case is rare when oxides are found below this point. Thus the milling ore is divided into two classes—oxide and sulphide ores in the ratio of two-thirds sulphide ores and one-third oxidized or "carbonate" ores, as they are termed locally.

In general the practice is to treat these ores separately. The mill bins hold large tonnages of ores, thus the mill will run for several days on sulphide ores and then will operate on carbonate ores. Each received the same treatment in crushing and jigging. Ores are crushed to $\frac{1}{2}$ inch and treated on Hartz jigs. The jig tailing is reground in Marcy ball mills to pass a 30-mesh Callow screen. From this point on the treatment will depend on whether the ore is sulphide or carbonate. Sulphide ores are sent to a Callow system of flotation and carbonate ores are classified and concentrated on Wilfley and Deister tables.

SULPHIDE SECTION.

Undersize from the 30-mesh Callow screens goes to three flotation units, all alike, and each will be described as one individual unit.

Oil is added, a drop at a time, as the pulp is discharged from the Callow screen. One thing to be noted here is the absence of any pulp thickeners. The water ratio in the pulp is controlled by the water fed to the Marcy mills. The pulp dilution is carried at about 20 per cent dry solids, as nearly as can be approximated.

A box distributor sends the pulp to three 3 by 14 foot Pachuca tanks, each of which feeds a flotation unit. In the Pachuca tanks the oil and pulp are emulsified. Two rougher cells receive the pulp from the Pachuca tank. The rougher tailing is elevated by two 4-inch air lifts to a second series of two rougher cells. These cells make froth concentrate which received further re-treatment in one recleaner cell. Tailing from the second rougher is sent to waste. Tailing from the recleaner cell is sent to a small two-spigot V-classifier and two tables. The products from this table are concentrate and tailing which is sent to waste. Concentrates from the first rougher cell, from the recleaner cell, and from the two middling tables are combined and elevated by a centrifugal pump to two 8-foot Callow cones. The thickened product is filtered by an 8 by 8 foot Portland filter.

Extractions previous to the installation of the Callow flotation process, when using Wilfley tables and vanners, were—lead, 96 per cent; silver, 82 per cent.

After the installation of flotation the total mill extraction dropped to—lead, 88 per cent; silver, 73 per cent.

This difference is due largely to the attempt at floating a 30-mesh product. Lead sulphide does not float when it is as coarse as this.

Oil used is "1580 Pensocola," and approximately 1.15 pounds is used per ton of dry pulp.

These extractions are taken from assay sheets for only two or three days and do not represent any long period of time. The ore to the mill is very changeable and these extractions may be misleading, but will serve in one way to show what this mill is doing. The same applies to the extractions and data on the carbonate-ore treatment.

Data on treatment of sulphide ores.

Kind of material.	Pb	Ag	Fe	SiO ₂
	<i>Per cent.</i>	<i>Ounces.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Heading to flotation.....	2.4	5.7	5.6	.....
Concentrate to flotation.....	24.2	40.0	13.8	.....
Tailing to flotation.....	0.5	1.8	3.6	.....
Extraction.....	80.8	^a 71.6	40.4	.....
Heading to jigs.....	6.4	10.8	10.4	.....
Concentrate to jigs.....	20.6	24.4	29.5	.....
Tailing to jigs.....	2.4	5.7	5.6	.....
Extraction.....	61.6	^a 76.8	57.8	.....
General mill heading.....	6.2	5.3	8.8	54.2
General mill concentrate.....	22.6	34.2	14.3	.....
General mill tailing.....	.7	2.3	2.6	.....

SILVER KING MILL ORE.

(Jan. 11, 12, and 13, 1916.)

General mill heading.....	5.0	6.46	.....	76.9
General mill concentrate.....	35.5	26.08	.....	.....
General mill tailing.....	1.0	3.3	.....	.....
Extraction.....	82.4	^a 54.5	.....	.....

^a Per cent.*Slime treatment of carbonate ores.*

	Pb, per cent.	Ag, ounces.
Deister heading.....	3.7	5.9
Deister concentrate.....	37.0	38.3
Deister tailing.....	2.64	4.5
Extraction.....	32.0	^a 26.9
Ratio of concentration for carbonate ores.....	.....	8:1
Ratio of concentration for sulphide ores.....	.....	4½:1

^a Per cent.

COSTS.

The last annual report published by this company was in 1913. From it we find that for the year ending April 30, 1913, 81,996 tons of second class ore were treated with the production of 12,996 tons of concentrate assaying: cent Pb, 55.76 ounces Ag, 0.0648 ounce Au.

Ratio of concentration, 6.5 into one.

Mill treated 230 tons per day.

<i>Costs per ton of ore treated.</i>	
Labor.....	\$0.3
Supplies.....	.0
Pumping.....	.0
Teaming.....	.0
Power.....	.0
Heating and light.....	.0
Repairs.....	.3
Assaying.....	.0
Superintendency.....	.0
Insurance.....	.0
Tailing release.....	.0
	.8

MILLS ON TAILING FLATS BELOW PARK CITY.

Below the town of Park City there are two large and two smaller mills over the tailings that have been discarded from Park City mills since 1880. The extent and value of these flats has been discussed under "Early Milling Leases."

BROADWATER MILL.

This mill is treating about 400 tons of tailing per day, but has a capacity 500 tons per 24 hours. From 900 to 1,200 tons per day are taken to the mill; half to two-thirds of this tonnage is stored as a "winter dump" in order that it may operate during the winter months when the ground is frozen.

Heading to the mill assays: Pb, 1 per cent; Zn, 4 per cent; and Ag, 4.5 ounces.

Lead-iron concentrates assay: Pb, 20 per cent; Zn, 12 per cent; Ag, 20 ounces per cent; SiO₂, 4 per cent.

Zinc concentrates assay: Pb, 6 per cent; Zn, 37 per cent; Fe, 11 per cent; per cent.

Zinc concentrate is being stored for treatment in the Daly-Judge electrolytic plant which will probably be in operation by the time this report appears in print.

BEGGS MILL.

This mill is located about one-half mile below the Broadwater mill.

These tailing deposits were located by Mr. Beggs in 1907 as placer claim claims in all were located on this flat. The deposit varies from 3 to 6 feet deep and is 200 feet wide and 2,500 feet long.

Tailing from the flat is scraped up into heaps by means of drag-line scraper or by a steam engine and requiring a crew of two men. The tailing is then shoveled into 16-cubic foot mine cars and trammed to the hopper at the mill.

Tailings from the table were being discharged in so many different and inaccessible places that it was found impossible for us to obtain even a representative sample, so none was taken. However, from data obtained from Mr. Beggs the extraction has been calculated:

	Pb.	Zn.	Ag.
Total extraction.....per cent..	63.5	61.1	30.5
Total received.....do.....	40.75	50.6	30.5

Mill treats approximately 50 tons per day.

Average heading to mill—Pb, 1.5 per cent; Zn, 4 per cent; Ag, 3.5 ounces.

Average lead-iron concentrate: Pb, 23 per cent; Zn, 16 per cent; Ag, 20 ounces; Au, 0.05 ounce; Fe, 18.5 per cent; SiO_2 , 3 per cent.

Average zinc concentrate: Pb, 6.4 per cent; Zn, 38 per cent; Ag, 10 ounces; Au, 0.03 ounce; Fe, 9.5 per cent; SiO_2 , 10 per cent.

Mill operated from May 1 to October 30, 1915, and produced 400 tons of zinc concentrate, and 200 tons of lead-iron concentrate. This represents 2.66 tons of zinc concentrate per day, and 1.33 tons of lead-iron concentrate per day.

Costs (for August, 1915).

Labor.....	\$964. 90
Power.....	104. 85
Repairs.....	35. 00
Fuel and extras.....	268. 80
Total cost.....	1, 373. 55
Total cost per ton.....	0. 915

Calculating from above concentrate assays and from the smelter contract we find (assuming average price of metals):

Payments.		Charges.	
Gold.....	\$0. 95	Treatment.....	\$4. 56
Silver.....	11. 00	Zinc.....	1. 80
Lead.....	15. 50	Silica.....	. 30
Iron.....	1. 85	Freight.....	2. 00
Total.....	29. 30	Sampling.....	. 50
Charges.....	9. 66	Hauling to railroad.....	. 50
Net from sale of 1 ton of lead concentrates.....	19. 64	Total.....	9. 66
Zinc payments.		Charges.	
Gold.....	\$0. 57	Treatment.....	\$12. 00
Silver.....	5. 21	Freight.....	6. 80
Zinc.....	35. 90	Sampling.....	. 50
Total.....	41. 68	Hauling to railroad.....	. 50
Charges.....	20. 80	Total.....	20. 80
Net from sale of 1 ton of zinc concentrates.....	20. 88		

Then from above:

50 tons of mill ore per day cost.....	\$45. 75
1.33 tons of Pb-Fe concentrates bring.....	26. 18
2.66 tons of zinc concentrates bring.....	48. 60
Profit per day.....	29. 03

BIG FOUR EXPLORATION CO. MILL.

This mill is located at Atkinson, 7 miles below the town of Park City.

The portion of tailing deposits under lease to the Big Four Exploration Co. covers an area $3\frac{1}{2}$ miles long, 500 feet wide, and averages 2 feet deep. The tonnage here available is in excess of 1,000,000 tons. Samples taken at 100-foot intervals along the flat indicate that the average metal content of this tailing is as follows: Pb, 1.8 per cent; Zn, 4.1 per cent; Ag, 3.1 ounces; Au, 30 cents; Fe, 2.5 per cent; SiO_2 , 62 per cent.

The tailing is scraped up by means of 8 or 10 teams with scrapers into heaps by the side of the railroad. From these heaps the tailing is scraped over a plankway bridging the tracks and four-ton cars. A converted Cadillac touring car provided with flanged wheels acts as the motor power to a train of four dump cars of 4-ton capacity each.

The mill was operated for a few months last fall, but was closed down for the winter, during which time it has been remodeled and changed. The mill is still being altered.

FLOTATION OF ZINC SULPHIDE ORES.*

When the work of the Salt Lake City station began only in the United States—the Butte & Superior, at Butte, Mo., using flotation in the recovery of zinc sulphide from slime. losses of zinc in slime evidently were rather large and some that would recover this zinc was necessary, steps were taken to obtain laboratory machinery for testing the applicability of flotation for different slimes. Representatives of Minerals Separation, the only flotation company maintaining offices in the United States at that time, did not seem to care to cooperate. The first test mills were built according to the designs printed in the only paper available, the first edition of Hoover's "Concentrating Ores by Flotation." The testing machinery described in the literature was crude and of the first attempts at flotation at the Salt Lake City station were rather disappointing. It became necessary to visit plants where flotation was practiced before much success was obtained in the laboratory.

By that time small flotation units were being built and installed in scores of mills. In view of the drift of public interest it was decided that the most service possible could be rendered by personally visiting plants that were using or should use flotation, by distributing pamphlets and by making suggestions. Further, much data was put into papers in technical journals. In these ways the Salt Lake City station has encouraged many people to publish their experiences. At the present time the necessity for flotation in many mills has been seen and the process installed. The only metal mining fields in which it has not been adopted to a large extent are the lead-zinc fields of Missouri, Kansas, and Oklahoma, and the Wisconsin zinc fields. Here the old milling methods with jigs and tables are often in the control of men who have been slow to see the need of treating the fine slime that escapes concentration on tables. Moreover, in the fields that are under technical control in these fields the amount of slime made in any one mill under present systems of grinding is so small that there is serious doubt as to flotation plants being economical. Flotation plants would have to be tended by the "table man" at each plant and would necessarily receive only occasional attention. Hence there is need for machines that automatically maintain pulp and pulp levels and discharge tailing without attention, and for automatic oil feeders and other accessories for plants capable of treating small tonnages—10 to 20 tons of slime a day, as determined by C. A. Wright,^b then assistant metallurgical engineer of the Bureau of Mines.

* Experimenters: G. L. Allen, F. Cameron, H. J. Morgan, C. A. Wright, and O. C. Ralston.

^b Wright, C. A., Mining and milling of lead and zinc ores in the Missouri-Kansas-Oklahoma zinc fields. Bull. 154, Bureau of Mines, 1918. 124 pp.

At present there are no machines that can practically take care of themselves for an hour at a time in a small plant with fluctuating feed. In addition there is the difficulty of training local labor to use a new process that is, to say the least, hard to understand.

In the Joplin district—Missouri-Kansas-Oklahoma field—all the ore mined on a piece of land must be treated, under the leasing system in effect, on that land, and slime from several mills can not be removed to a common point for treatment. The landowners believe that the value of a piece of ground is increased by the presence of a mill, and as the land is generally leased in 40-acre tracts, the capacity of the mills is usually restricted to 100, 200, or 400 tons a day with about 3 to 10 per cent of slime formed by crushing. A number of such mills have tried flotation but, as far as is known, few of these have yet been able to run at a profit. Although the daily loss in any one plant is not large, yet as there are over 200 mills in the Joplin district, the aggregate losses of zinc in slime is enormous. Only a change in grinding methods, the development of a small automatic flotation machine, or the changing of the present leasing system in the Joplin district will permit the general use of flotation for the slimes of the district, and the saving of the zinc now lost in the "chats." It is highly probable that the development of a small unit will be easier than a change of the leasing system.

That the flotation of the Joplin slimes is not difficult was determined by a few tests in the laboratory at the Salt Lake City station. Material containing 8.54 per cent zinc, the sample being from one of the mills treating "sheet ground" ore, could be "roughed" and cleaned in either a mechanically driven or an air machine. "Rougher" concentrates containing 35 to 49 per cent zinc could be made with most of the commercial flotation oils, such as wood creosote, coal creosote, pine oil, and pine-tar oil, pine-tar oil seeming to be the best. The recoveries were 85 to 91 per cent of the total zinc. In recleaning samples of "rougher" froth containing 39 per cent zinc, it was possible to obtain a concentrate containing 52 per cent zinc. The addition of sulphuric acid in the flotation of this ore was not necessary, but as it made the line of separation between the yellow froth and the white gangue more easily seen through the glass sides of the test machine used, amounts of about 50 pounds per ton of ore were used for that purpose. Assays of concentrates made without addition of acid were practically as good as those of concentrates made with it.

Thus there seems to be no technical difficulty in successful flotation of the zinc in the slimes of the Joplin district, although there is a serious doubt as to whether flotation can be made to pay in the present state of the art. The Bureau of Mines is not in a position to develop units of the size needed by the mills of the district, but there is evidently a good opportunity there for an inventor or a development company.

DIFFERENTIAL FLOTATION.

Differential flotation is the name given to that type of flotation in which one floatative mineral is floated in the presence of another. An example is the flotation of lead sulphide in the presence of zinc sulphide. Some persons have called this "preferential" and others have called it "selective" flotation, but the term "preferential" has been used by the inventor of a patented process of flotation in which the ore receives a slight roast in order to deaden the surface of the floatative minerals, and the term "selective" has been applied to that type of flotation in which the oils and other floatation reagents select the valuable minerals in the presence of the gangue, thus effecting the separation of a clean concentrate.

One of the most pressing problems of metallurgy at present is the treatment of complex sulphides of zinc, lead, iron, and occasionally copper. Differential flotation promises to be successful for these ores, and already a number of mills are using it. Two of the general problems are of major importance: (1) The separation of zinc and lead sulphides, and (2) the separation of zinc and iron sulphides. Possibly the latter is the more important, because it is more difficult.

ZINC-LEAD SULPHIDES.

In general, mixed zinc and lead sulphides are separated by differential flotation, but usually the separation is only partial. The method in widest use is based on the fact that in a neutral or alkaline solution, when an oil like pine oil is added in small quantity to a pulp containing both lead and zinc sulphides, galena is the only mineral that floats. Addition of more oil and stirring the pulp causes the sphalerite to float. This method is partly successful, and it is necessary to treat both concentrates by breaking down the flotation froth and passing the concentrates through tables in order to separate the lead in the zinc concentrate and the zinc in the lead concentrate. Even by this procedure the concentrates are not always the most desirable, as 15 to 20 per cent of zinc is sometimes left in the lead concentrate and as much as 10 per cent of lead in the zinc concentrate. Hence, differential flotation cannot be regarded as a complete success. The authors know of only a few instances of better work. In fact, the authors, after running a number of tests to see if better work could be done in the laboratory, decided that there was more promise in making a mixed lead and zinc concentrate, and then separating the two metals by chemical means. Work on the chemical separation of such mixed concentrates is reported in other parts of this bulletin and in another paper.

* Lyon, D. A., and Ralston, O. C., Innovations in the metallurgy of lead: Bull. 157, Bureau of Mines, 1918, pp. 123-169.

However, it is not impossible that better methods of differential flotation can be developed, and the Bureau of Mines intends to conduct investigations to that end.

ZINC-IRON SULPHIDE MIXTURES.

Zinc-iron sulphide mixtures offer one of the most pressing problems of differential flotation. In the past the grains of the two sulphide minerals, if too small to permit mechanical separation without fine grinding, could not be separated; nor was there any way of separating the blende and pyrite in the slime formed in the regular milling of zinc ores containing pyrite. Moreover, the two minerals can not be separated when mixed in a flotation concentration, as they have about the same specific gravity.

The only method that has proved at all successful is roasting at temperatures below 600° C., the "ignition point" of pyrite, long enough to destroy the sulphide surfaces of the pyrite particles without affecting the blende particles, followed by flotation treatment to remove the latter. The objection to this process is that in a gravity mill, where the fines are an incidental product, the fines must be dewatered, roasted, and then mixed with water for flotation.

For treating an ore that has never been milled successfully before, the installing of a process in which the ore is roasted before being mixed with water and ground for flotation is easy, for no mill product would have to be dewatered and dried before roasting, and only flotation would be used. Tests at the Salt Lake City station have shown that a simple roast to deaden the surfaces of pyrite does not suffice for coarsely ground ore, but by a longer roast the particles of pyrite are almost completely altered, much of the iron being burned to the red oxide without much oxidizing of the zinc. These tests showed, too, that sulphuric acid was almost essential in the flotation of the zinc from the roasted ore. Fine grinding after such a roast is much easier than before. This method has the advantage of a simple flow sheet for the mill. Its success, of course, is due to the fact that the roasting of zinc sulphide usually does not proceed much at a temperature below 600° C.

Addition of soluble oxidizing agents, such as potassium or other permanganates, bichromates, and chloride of lime, has been proposed by numerous inventors, but so far has been found of little value for most of the ores tested in the Salt Lake City laboratory. Usually the inventors propose to add these agents to the mill pulp in which the zinc and iron sulphides are suspended and to allow a sufficient time of contact before flotation. Whether the surfaces of one of the minerals is really oxidized seems debatable, as with mixtures of galena and blende the chromates cause the zinc mineral to float and the permanganates cause the lead mineral to float differen-

tially. It is argued that if oxidation is all that takes place the reagents should produce the same effect. Be that as it may, dizers seem to be among the most effective reagents for obtaining differential flotation.

In a number of flotation mills the zinc concentrate seems contaminated with iron. In these mills either the pyrite has naturally oxidized to a condition where it does not tend to float the slime (from a gravity mill) does not contain as much iron as heading, because the pyrite slimes less than the galena and the blende.

In a few instances, mostly tests on a laboratory scale, copper sulphate as an addition agent improved slightly the flotation of zinc sulphide from slimes containing some iron pyrite. Copper sulphate reacts with zinc sulphide, forming a coating of copper sulphide on the zinc and this is supposed to make the zinc sulphide more easily floatable. Although copper sulphate is excellent for correcting poor flotation of zinc sulphide, it has not proved very acceptable for differential separation in at least one mill, although laboratory tests seemed to promise improved work.

A list of the most important American and British patents covering differential flotation is as follows:

United States patents: H. A. Wentworth, No. 938732, Jan. 2, 1909; E. J. Horwood, No. 1020353, Feb. 16, 1909; A. S. Ramage, No. 949002, July 2, 1909; E. H. Nutter and Henry Lavers, No. 106748, Sept. 1, 1911; H. H. Greenway and A. H. P. Lowry, No. 110273, May 17, 1913; E. J. Horwood, No. 1108440, Dec. 4, 1913; Henry Lavers, No. 1142821, May 28, 1914; T. M. Owen, No. 1157176, Feb. 27, 1914; G. S. Meikle, No. 1182290, Oct. 9, 1914; R. F. Bacon, Nos. 1198589 and 1197590, June 28, Nov. 10, 1915; F. J. Lyster, Nos. 1203372, 1203373, 1203374, and 1203375, May 8, 1913.

English patents: H. L. Sulman and H. F. K. Picard, No. 8650, Apr. 9, 1910; Henry Lavers, No. 23870, Oct. 14, 1910; H. H. Greenway, No. 11471, May 16, 1913; F. J. Lyster, No. 11939, May 22, 1913; Minerals Separation (Ltd.), No. 16141, July 12, 1913; Leslie Bradford, No. 21104, Sept. 18, 1913; Amalgamated Zinc (De Bavay's) (Ltd.), Ore Treaters, No. 9049, Apr. 9, 1914; Minerals Separation and De Bavay's Processes Australia Proprietary (Ltd.), Metallurgists, Nos. 19373 and 19374, Sept. 2, 1914; Leslie Bradford, No. 21880, Nov. 2, 1914; Minerals Separation (Ltd.), Metallurgists, Nos. 5650, 8746, and 10478, Apr. 14, June 14, July 19, 1915.

At the plant of a leasing company, which is working over the tailing of the concentration mill at the Midvale (Utah) smelter of the United States Smelting Co., a mixed concentrate of zinc and lead was separated from an ore, which also contains some pyrite, by the use of 8 pounds of lime per ton of ore. The pyrite was said to be dropped from the flotation froth, and the mixed concentrate of sphalerite and

galena was separated on concentrating tables. While marketable zinc concentrate can be separated and likewise marketable lead concentrate, the separation is none too clean and leaves much to be desired.

DRY CONCENTRATION PROCESSES.

There are three accepted dry methods of separating zinc minerals or zinc compounds from zinc sulphide ores, as follows: "Igneous" concentration, electrostatic separation, and magnetic separation.

IGNEOUS CONCENTRATION.

By igneous concentration is meant heating zinc ores with a blast of air to a temperature high enough to cause the zinc to volatilize and later be oxidized by the oxygen of the blast. This method is largely used in treating oxidized zinc ores and roasted sulphide ores. The usual procedure is to roast the sulphide ores to the oxide condition, mix them with fuel, such as anthracite or coke breeze, and place the mixture on a grate through which a blast of air is forced. The burning of the fuel heats the ore to a temperature at which the zinc can be reduced by the carbon or the carbonaceous gases. The zinc distills and is oxidized in the stream of air, the white zinc oxide produced, known as "American process" zinc oxide, being caught in a bag house. A discussion of igneous concentration and an account of some experiments made by the authors will be found in a subsequent section of this book.

The sulphide zinc ores now sent to igneous concentration plants are usually complex sulphides of zinc, iron, and lead which can not be separated by the standard methods of separation; hence the prices paid for these ores are usually lower than what would be paid for the several minerals if these could be mechanically separated. Many complex mixtures of zinc and iron sulphides not mechanically separable are used, the iron not interfering with the recovery of the zinc. Any lead present forms lead sulphate, which as fume is caught with the zinc oxide in the bag house, the white pigment being then known as a "leaded zinc" pigment. All of these sulphide ores are usually roasted and the sulphur dioxide gases are used for sulphuric acid manufacture. Consequently those igneous concentration plants that accept sulphide ores prefer the ores to contain some pyrite, because of its facilitating the preparation of gases suitable for making sulphuric acid. Direct "blasting" of zinc sulphide ore in making zinc oxide pigment is not in use in any part of the world, so far as the authors are informed. It is said that if sulphide ores are blasted without previous roasting, the pigment will contain too much zinc sulphate, which is undesirable. Also the zinc oxide absorbs sulphur dioxide with some avidity, which causes "livering" of the paints prepared from the

product. Such material needs to be calcined at a temperature high enough to drive off the sulphur dioxide. As regards the preparation of a zinc oxide product suitable for distillation of zinc, the presence of zinc sulphate and sulphur dioxide would probably not be objectionable. Hence, as a method of concentrating the zinc in a mixed sulphide ore, igneous concentration is practicable.

At Florence, Colo., the River Smelting Co. has recently installed a blast furnace for direct treatment of mixed sulphide ores. A strong blast is used and a shallow bed; thus the furnace operates with a hot top. Most of the pyrite of the ore oxidizes and the iron oxide enters the slag. Some of the iron and all of the copper go into a matte, which also collects the precious metals. The lead and most of the zinc are distilled as fume and are caught in the bag houses. Some of the zinc goes into the matte and the slag, and to date the recoveries of zinc in the fume have been lower than is desirable. Also, fume deposits as crusts on the walls of the furnace, necessitating a shutdown every 10 days or two weeks for cleaning the walls.

At the Tooele smelter in Utah an attempt to smelt complex sulphides and then "blow" them in a copper converter met the same difficulty, accretions of zinc oxide forming on the walls of the converter.

ELECTROSTATIC SEPARATION.

Electrostatic separation, as previously mentioned, is one of the processes used for separating mixtures of sulphides of the same specific gravity that are not amenable to gravity concentration. Zinc ore mixtures of pyrite and sphalerite in coarse crystals are often treated by this process. Such ore needs only drying before treatment on the electrostatic separator. The principle of the electrostatic separators need not be explained here, as there is ample literature on the subject. From 1905 to date there have usually been several papers published every year on this process in such publications as *Mineral Industry*, *Engineering and Mining Journal*, *Metallurgical and Chemical Engineering*, and the *Transactions of the American Electrochemical Society*. The nonconductive mineral particles pass through the separator inert, but the particles of the conductive minerals acquire an electrical charge and are repelled from one electrode. Sphalerite is a poor conductor or a nonconductor, and pyrite is a good conductor. Galena is likewise a good conductor and accompanies the pyrite. Fine dust can not be treated on such a machine, its use being limited to the treatment of "sands."

As ores vary widely in their electrical properties, the only way of finding whether a given ore of zinc sulphide and other sulphides can be separated by this method is to test the ore in a commercial machine. With some ores electrostatic separation produces concentrates of commercial grade without further treatment, but as a rule none of the

electrostatic processes will make a clean separation of the average complex sulphide ore found in the intermountain States. The fact that pyritic ore does not have to be roasted before electrostatic separation is important, as the sulphur can be saved, if desired. If the magnetic separation process were used, some of the sulphur in the ore would be burned off and escape in the smelter gases, forming a nuisance. Another advantage of the electrostatic method is that mixtures of galena, pyrite, chalcopyrite, and sphalerite can be separated into a product containing the first three minerals mentioned and a second product containing the sphalerite. These two products can both be marketed to good advantage. The magnetic separation process, however, makes a product containing the iron and the copper and another product containing the lead and the zinc; and this latter mixture can not be marketed to as good advantage as if the lead and zinc minerals were separated.

MAGNETIC ROASTING AND SEPARATION.

The method of separating zinc and iron sulphides by the use of a magnetic separator is an old one. There are many ores, in districts like the Wisconsin zinc district, which are mixtures of the two sulphides that can be easily separated by this method, and in these places the practice has become standard. In the intermountain States, however, there are many sulphide ores that do not respond to this treatment. Determining the character of such ores by their appearance is difficult, and the best way of finding whether a given sample of ore is amenable to magnetic separation is to test it.

EXPERIMENTS AT SALT LAKE CITY STATION.

The Zinc Concentrating Co., in cooperation with the University of Utah and the Bureau of Mines, set up one of its Campbell magnetic separators and a small Etherington-Singer roaster at the Salt Lake City station in order to test mixed sulphide ores from various western districts.

DESCRIPTION OF ROASTER AND MAGNETIC SEPARATOR.

The Etherington-Singer roaster is a revolving cylindrical kiln, tapering slightly toward the flue end and being fired with oil or gas. The small laboratory roaster used for the tests was an iron cylinder 7 feet long and about 1 foot in diameter. Heating was by means of two large oil blow-torch flames, the roaster generally requiring about one hour's heating to attain the temperature necessary for a quick roast under these conditions. The roaster was so inclined that when it was making four revolutions per minute the ore passed through it in 7 minutes. The ore, just before discharging, showered through the flame from the torches. It was found that under these conditions enough of the sulphur in the pyrite was quickly eliminated and the product,

because of the nonoxidizing character of the flame, had not been oxidized too much. Of course, the object in magnetic roasting is to raise the ore to such a temperature that the pyrite breaks up into FeS or $\text{Fe}_x\text{S}_x + 1$, and S . Pyrite is not magnetic, but the lower sulphides of iron are ferromagnetic, and are capable of being lifted by a magnet of low intensity. Sphalerite is nonmagnetic; hence the magnetic separator removes the iron and leaves the sphalerite, with any other nonmagnetic minerals present.

The Campbell magnetic separator comprises a shaking plate so inclined that the ore travels down it in a thin sheet; above this plate are suspended three electromagnets. Beneath the face of each magnet passes a canvas belt, so that any particle attracted to the magnet is arrested by the belt, which carries the particle over the edge of the shaking table and beyond the field of the magnet, when the particle drops from the belt. The three magnets used are of increasing intensity, so that the separator makes three products which are decreasingly magnetic, and a nonmagnetic product. The distance of the faces of the magnet poles from the table is adjustable, and rheostats control the amperage flowing through each magnet, so that a stronger or weaker magnetic field is obtainable.

TESTS OF ORES.

Very few of the western ores not now being worked that were tested had sufficiently coarse crystallization to permit magnetic separation of the iron sulphide from the zinc sulphide. Tests were made of ore from the Utah-Apex mine, Bingham, Utah; zinc middling from the Broadwater mill at Park City, Utah; zinc middling from the Consolidated Nevada-Utah mill at Pioche, Nev.; ore from the Greenwood lease, Pioche, Nev.; ore from the Carlyle mine, Duncan, Ariz.; ore from the Middle Golconda mine, and ore from the C. O. D. mine, near Chloride, Ariz., and others.

As stated above, only a few of the ores responded satisfactorily in the tests. The essential data on the more important tests follows.

ZINC-IRON MIDDLING FROM UTAH-APEX MINE, BINGHAM, UTAH.

The Utah-Apex mine at Bingham, like most of the other Bingham lead mines, has not saved the zinc in its ore, much of the ore being shipped crude to the lead smelters. This ore has the following analysis:

Composition of ore from Utah-Apex mine, Bingham, Utah.

Lead (Pb).....	per cent..	16.65
Zinc (Zn).....	do....	14.45
Iron (Fe).....	do....	17.80
Insoluble.....	do....	16.50
Silver (Ag).....	ounces per ton..	4.34
Gold (Au).....	do....	.04

The lead mineral in this ore can be separated by mechanical concentration, but the zinc and iron minerals, having the same specific gravity, are obtained as a zinc-iron middling and the high iron makes this middling unsalable as a zinc product. As the ratio of the iron content to the silica content is such that the ore is self-fluxing, it is sought by the smelters and often contracts can be obtained which ignore the high zinc content. Hence very little concentration of this grade of ore has been practiced. By making a middling on Wilfley tables, a product containing zinc sulphide, iron sulphide, and quartz was obtained, and on tabling the gangue a product of the following analysis was obtained:

Results of analysis of zinc-iron middling.

Lead (Pb).....	per cent..	1.31
Zinc (Zn).....	do....	34.80
Iron (Fe).....	do....	12.70
Insoluble.....	do....	13.20
Silver (Ag).....	ounces per ton..	1.61
Gold(Au).....	do....	.01

Such a product could not be marketed to advantage as zinc concentrate; so this middling was subjected to magnetic roasting and separation. In the treatment on the magnetic separator, the intent was to remove most of the iron, the magnets being set for a low intensity, and then re-treat the zinc concentrates with a more intense field. The results of these tests are given in Table 7 following:

TABLE 7.—*Results of magnetic separation of Utah-Apex zinc-iron middling.*

Sample.	Weight, pounds.	Pb.		Fe.		Zn.		Insoluble, per cent.	Ag.		Au.	
		Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.		Ounce.	Per cent of total.	Ounce.	Per cent of total.
Raw heading.....	74.5	1.31	100.0	12.7	100.0	34.8	100.0	13.2	1.61	100.0	6.01	100.0
Roasted heading.....	66.0	1.43	96.8	12.9	90.2	38.1	97.2	13.8	1.63	90.2	.01	88.6
Nos. 1 and 2 "iron" middlings.....	5.75	.95	5.8	49.6	23.5	6.0	1.4	8.6	2.19	11.6	.01	8.7
No. 3 "iron" middling.....	5.75	1.55	9.4	40.1	27.0	12.1	2.8	9.4	3.11	16.6	.01	8.7
Zinc concentrate.....	53.0	1.55	86.8	6.1	37.8	45.0	94.9	14.6	1.51	74.0	.01	80.0
All "iron" middlings.....	3.75	2.98	8.7	26.2	8.0	26.2	2.7	9.4	4.12	10.4	.02	4.2
Zinc concentrate.....	48.5	1.43	72.5	4.94	28.2	46.8	89.5	14.8	.....	.....	.....	.....

ORES FROM THE CONSOLIDATED NEVADA-UTAH AND THE GREENWOOD MINES, PIOCHE, NEV.

The ore from the Consolidated Nevada-Utah mine and that from the Greenwood lease are representative of two types of ore found in the Pioche, Nev., district. The former represents the deeper lying ore in the vein deposits of that district, and the latter the complex, partly oxidized sulphides nearer the surface. This latter type of ore is much more complex and difficult to separate than the first. It can be seen from Tables 8 and 9 that marketable zinc concentrate could be prepared from the Consolidated ore, whereas

a good separation of the zinc and lead minerals from the iron sulphide in the Greenwood ore is practically impossible. High-iron zinc ore or zinc-lead ore is sold for the manufacture of zinc oxide or leaded zinc oxide, although the price paid for the ore is not equivalent to that paid for the separate lead and zinc concentrates that might be made. The companies buying such ore usually specify 35 per cent combined zinc and lead content as the lower limit of the material that they will accept for making zinc oxide. The Greenwood ore can be prepared for such a market by double treatment with magnetic separators, as can be seen from Table 9, but the loss of zinc in the iron concentrate is too great.

TABLE 8.—Results of magnetic separation of ore from Consolidated Nevada-Utah mine.

Sample.	Weight, pounds.	Pb.		Fe.		Zn.		Insoluble, per cent.	Ag.		Au.	
		Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.		Ounces.	Per cent of total.	Ounces.	Per cent of total.
Raw heading.....	100.0	2.92	100.0	28.4	100.0	17.9	100.0	7.8	11.46	100.0	0.22	100.0
Roasted heading.....	84.0	3.27	94.3	30.3	91.2	19.0	89.2	9.2	12.52	92.0	.24	91.6
No. 1 "iron" middling.....	5.0	1.72	3.4	53.0	11.3	5.6	1.9	5.0	12.32	6.4	.28	7.6
No. 2 "iron" middling.....	7.75	1.43	4.0	50.5	15.1	6.2	3.0	4.0	14.38	10.6	.22	8.4
No. 3 "iron" middling.....	31.5	2.47	28.3	43.5	53.0	9.5	18.7	6.6	15.82	47.4	.88	59.7
Zinc concentrate.....	37.5	5.05	68.8	13.6	19.7	35.5	83.3	12.6	11.14	39.7	.24	44.7
No. 3 "iron" re-separated, making—												
Nos. 1 and 2 "iron" middlings.....	7.5	1.37	8.7	51.0	14.8	5.4	2.5	4.0	11.58	8.2	.36	13.4
No. 3 "iron" middling.....	20.5	2.32	17.3	45.3	35.9	7.9	10.1	6.4	16.08	31.8	.32	32.6
Zinc concentrate.....	3.5	4.94	6.3	21.6	2.9	26.1	5.7	13.4	16.86	5.6	.36	6.3
No. 1 zinc concentrate re-separated, making—												
All "irons".....	4.5	3.57	5.8	28.0	4.9	17.0	4.8	13.8	13.84	5.9	.56	12.5
Zinc concentrate.....	31.5	4.28	49.2	11.1	13.5	33.1	75.3	12.0	8.70	26.1	.46	71.9
Last zinc concentrate re-roasted and re-separated, making—												
No. 1 "iron".....	3.0	2.14	2.3	45.9	5.3	7.8	1.5	5.8	4.26	1.2	.16	2.4
No. 2 "iron".....	1.5	4.88	2.7	23.0	1.3	21.8	2.0	14.4	13.72	2.0	.96	7.1
Zinc concentrate.....	24.0	5.23	45.8	6.5	6.0	44.6	67.1	12.2	8.72	19.8	.38	45.3

TABLE 9.—Results of magnetic separation of ore from Greenwood lease.

Sample.	Weight, pounds.	Pb.		Fe.		Zn.		Insoluble, per cent.	Ag.		Au.	
		Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.		Ounces.	Per cent of total.	Ounces.	Per cent of total.
Raw heading.....	44.0	8.21	100.0	15.1	100.0	20.0	100.0	25.2	8.11	100.0	0.04	100.0
Roasted heading.....	35.5	9.05	88.9	15.7	84.2	20.0	80.8	27.4	9.06	87.7	.04	80.7
Nos. 1 and 2 "iron" middlings.....	1.0	5.77	1.8	44.9	8.0	5.2	.7	12.6	8.28	2.6	.06	4.2
No. 3 "iron" middling.....	2.75	8.56	7.4	35.8	17.6	7.1	2.7	17.0	10.04	8.6	.06	11.6
Zinc concentrate.....	20.5	9.51	87.6	13.6	72.0	21.7	90.2	28.2	8.98	82.3	.04	83.1
"Iron" middling from zinc concentrate.....	17.0	9.28	49.3	15.7	47.8	18.8	45.0	29.8	8.90	46.9	.04	47.9
Re-treated zinc concentrates.....	9.0	9.75	27.3	8.7	13.6	27.4	34.8	26.6	8.20	22.9	.04	25.4
No. 2 "iron" middlings from No. 1 "iron".....	8.5	8.45	22.4	18.9	29.9	15.0	18.0	28.8	8.88	19.7	.04	23.9
Zinc concentrate from "iron" middlings.....	5.0	8.50	13.2	8.66	7.8	25.5	18.0	29.8	7.48	11.6	.04	14.1

ZINC-IRON MIDDLING FROM BROADWATER MILL, NEAR PARK CITY, UTAH.

Near Park City, Utah, a large accumulation of old mill tailing is being treated by a number of mills, and large amounts of zinc-iron middling are produced. The question has been raised as to what should be done with it. The sample from the Broadwater mill represents a product such as could have been made during the milling of countless tons of the Park City ores in the past, and could be prepared from the ores now being mined. A marketable zinc concentrate from such zinc-iron middling is possible, as shown by the tests reported in Table 10 following:

TABLE 10.—*Results of magnetic concentration of zinc middling from the Broadwater mill.*

Sample.	Weight, pounds.	Pb.		Fe.		Zn.		Insoluble, per cent.	Ag.		Au.	
		Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.		Ounces.	Per cent of total.	Ounces.	Per cent of total.
Raw heading.....	112.0	6.36	100.0	27.4	100.0	18.1	100.0	3.2	12.74	100.0	0.02	100.0
Roasted heading.....	96.0											
No. 1 and 2 "iron" middlings.....	19.0	4.23	11.8	53.4	33.1	3.3	3.1	1.8	14.97	19.9	.03	25.5
No. 3 "iron" middling.....	23.5	3.93	15.7	44.7	41.5	5.0	7.1	1.8	16.14	32.2	.02	25.5
Zinc concentrate.....	50.5	8.95	63.5	11.6	19.1	36.9	92.3	4.8	12.32	45.3	.02	45.2
Zinc concentrate re-separated making—												
All "iron" middlings.....	9.0	6.01	7.6	37.8	11.1	3.0	3.6	2.4	18.06	11.3	.02	8.0
Zinc concentrate.....	40.5	9.65	55.0	6.8	9.0	41.7	83.7	4.8	11.36	32.3	.02	36.2

ORE FROM CARLYLE MINE, STEEPLEROCK, N. MEX.

The ore from the Carlyle mine, near Steeplerock, N. Mex., was tested without removal of the gangue. This was a complex sulphide ore carrying zinc, lead, copper, and iron. The deposit at this mine represents a fairly common ore type in this district, the sulphide ore coming from beneath an old bonanza oxidized gold-ore body. There are many similar mines in which oxidized ores of silver, gold, or copper changes to complex-sulphide ores below the water level. In this sample the sulphides were more or less separable from each other but were intimately combined with the gangue, so that the preparation of products not contaminated with too much gangue was difficult. This was especially true of the zinc concentrate. The only encouraging feature of the test was that the iron products from the magnetic separation carried a good proportion of the copper of the original ore in a concentrate that was marketable. (See Tables 11 and 12.)

The raw ore was ground to pass 20-mesh and then was given a heavy roast in the laboratory roaster. The calcines were then put through the magnetic separator with the magnets set fairly close. The "irons" from the above test were reground to pass 40-mesh and then put over the magnetic separator again, making a magnetic and a

nonmagnetic product. The zinc concentrate obtained from the roasting and separation of the Carlyle zinc middlings from a table test was treated on the small test table to see what kind of a separation could be obtained after roasting. The results were as follows:

TABLE 11.—Results of magnetic separation of ore from Carlyle mine, roasting without tabling.

Sample.	Weight, pounds.	Pb.		Zn.		Fe.		Cu.		Insoluble, per cent.
		Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.	
First separation:										
Roasted heading.....	19.0	6.43	100.0	7.6	100.0	3.8	100.0	1.21	100.0	69.6
All "iron" middlings.....	2.25	13.32	24.6	6.8	10.6	10.0	31.2	6.74	66.1	47.8
Zinc concentrate.....	16.5	4.76	64.4	7.8	86.4	2.6	59.5	.50	35.6	73.8
Separation of iron concentrate:										
Heading.....	845.0	11.32	100.0	6.8	100.0	10.0	100.0	6.74	100.0	47.8
Nonmagnetic.....	390.0	11.2	38.9	8.3	55.3	3.6	16.6	.88	6.0	61.6
Magnetic.....	396.0	12.97	45.7	6.0	41.2	16.7	78.2	11.92	82.8	32.6
Tabling zinc concentrate from zinc middling:										
Heading.....	1,000.0	9.2	100.0	17.9	100.0	3.3	100.0	.38	100.0	39.2
Lead concentrate.....	245.0	13.7	36.5	25.7	36.2	3.0	22.3	.50	32.1	15.0
Zinc concentrate.....	350.0	9.64	36.6	21.5	42.1	3.2	33.9	.44	46.5	28.0
Tailing.....	350.0	4.75	18.1	10.2	19.9	3.5	37.1	.44	40.5	67.4

In another test the ore was first tabled after being ground to pass a 20-mesh screen. Three products were obtained—a lead concentrate, a zinc middling, and a tailing. The slime was not recovered; this accounts for the low recovery of copper, as the chalcopryrite slimes badly and was lost. The zinc middling obtained was put through the laboratory roaster and then through the magnetic separator. The concentrate obtained was again sent through the magnetic separator, with the magnets set closer together, to see if any more iron could be removed. The results of the tests are as follows:

TABLE 12.—Results of magnetic separation of ore from Carlyle mine, with tabling.

Sample.	Weight, pounds.	Pb.		Zn.		Fe.		Cu.		Insoluble, per cent.
		Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.	Per cent.	Per cent of total.	
Table test:										
Heading.....	40	14.2	100.0	9.4	100.0	5.0	100.0	1.16	100.0	37.6
Lead concentrate.....	5	62.0	54.8	12.0	17.3	3.3	8.3	1.98	14.9	3.2
Zinc middling.....	9.75	12.5	21.5	18.4	47.6	5.4	26.3	2.21	46.3	44.4
Tails.....	19.4	2.02	6.9	4.1	21.1	3.6	35.0	.55	23.1	32.6
Zinc middling roasted:										
Raw heading.....	3,628	12.5	100.0	18.4	100.0	5.4	100.0	2.21	100.0	44.4
Roasted heading.....	3,977	10.1	89.5	18.0	95.2	5.6	100.0	1.93	95.4	38.2
Through separator.....	3,862	10.1	100.0	16.0	100.0	5.6	100.0	1.96	100.0	38.2
No. 1 and No. 2 "iron" middlings.....	255	11.7	7.6	4.3	1.8	25.1	29.6	12.21	41.3	18.0
No. 3 "iron" middling.....	285	12.3	9.0	9.5	4.4	12.5	16.8	7.18	27.5	33.2
All "iron" middlings.....	195	19.3	9.6	14.9	4.7	6.5	5.9	2.21	5.8	35.2
Zinc concentrate.....	3,070	9.2	72.5	17.9	86.0	3.3	47.0	.38	18.7	39.2

ORES FROM MINES NEAR CHLORIDE, ARIZ.

The ore from the C. O. D. mine, near Chloride, Ariz., is from a deposit somewhat similar to that in the Carlyle mine. However, this sample yielded commercial grades of concentrate, both of lead and of zinc, as shown in Table 13.

TABLE 13.—Results of magnetic separation of ore from C. O. D. mine, near Chloride, Ariz.

Sample.	Weight, pounds.	Pb.		Zn.		Fe.		Insoluble, per cent.	Ag.		Au.	
		Per cent.	Per cent recovered.	Per cent.	Per cent recovered.	Per cent.	Per cent recovered.		Ounces.	Per cent recovered.	Ounces.	Per cent recovered.
Tabling test:												
Ore		3.69		7.0		7.1		61.6	18.5		0.30	
Table feed	47.5	3.57	100.0	7.2	100.0	6.9	100.0	62.6	16.9	100.0	.30	100.0
Lead concentrate	2.5	99.70	58.6	7.8	5.6	17.2	18.1	2.4	64.5	20.2	1.40	24.5
Zinc concentrate	13.37	2.50	19.5	20.0	81.7	12.7	53.3	20.8	27.4	45.6	.45	42.8
Tailing	27.50	.24	8.9	1.5	12.7	2.4	20.1	80.2	5.5	18.8	.06	9.8
Slime	4.20								20.8	10.6	.80	8.4
Roasting and separating first zinc concentrate:												
Raw heading	200	2.5	100.0	20.0	100.0	12.7	100.0	20.8	27.4	100.0	.45	100.0
Roasted heading	176	2.8	98.8	24.8	100.0	15.0	96.5	21.6	29.5	95.1	.45	88.2
Nos. 1 and 2 "iron" middlings	34	1.13	7.9	3.0	2.3	40.7	52.2	10.8	51.9	35.2	.90	40.0
No. 3 "iron" middling	24	2.26	10.9	7.9	4.4	29.4	26.7	18.6	32.2	15.4	.50	15.7
Zinc concentrate	110	3.	74.2	38.5	97.1	3.8	12.9	26.0	20.8	45.6	.25	35.9
Last zinc concentrate tailed:												
Feed	105	3.33	100.0	33.5	100.0	3.3	100.0	26.0				
Lead concentrate	4	20.0	22.8	37.7	3.7	3.5	3.5	7.8				
Zinc concentrate	66	2.95	53.2	44.2	71.0	3.5	57.2	19.1				
Zinc middling	34	1.55	15.1	27.0	22.7	4.6	39.1	41.7				

The Middle Golconda mine, near the Chloride, Arizona, district has zinc-iron sulphide ore carrying small amounts of silver, lead, and copper. On account of the small lead content it was difficult to get a clean galena concentrate free from zinc on the concentrating tables. The zinc-iron middling could be separated easily into a zinc concentrate of commercial grade and an iron concentrate, containing some lead and silver, which could either be combined with the lead concentrate produced on the tables, or discarded, according to the distance from a lead smelter. The flotation of the slime of this ore produced a mixed lead-zinc sulphide concentrate that could be marketed, although not to as good advantage as separate lead and zinc concentrates. The results are shown in Table 14.

RECOVERY OF ZINC FROM ORES.

TABLE 14.—Results of concentration tests of ore from Middle Goleonda mine.

	Weight.	Pb.		Zn.		Fe.		Cu.		Insoluble, per cent.	Ag.		Au.		
		Per cent. recovered.		Per cent. recovered.		Per cent. recovered.		Per cent. recovered.			Per cent. recovered.		Per cent. recovered.		
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Ounces.	Per cent.		Ounces.	Per cent.			
Table test of 20 to 40 mesh ore:															
Ore.....	Ounces.														
Heading.....	386	0.80	100.0	14.0	100.0	9.7	100.0	0.11	100.0	48.2	8.47	100.0	0.04	100.0	
Lead concentrate.....	34	83	100.0	12.4	100.0	9.2	100.0	0.11	100.0	53.0	1.96	100.0	.02	100.0	
Zinc concentrate.....	64	34.20	49.4	23.1	2.2	10.5	1.4	.36	3.8	3.4	17.06	10.3	.28	16.7	
Zinc middling.....	88	2.19	53.4	35.3	57.6	11.2	24.0	.33	60.5	15.0					
Tail.....	161	.18	4.4	12.5	26.4	9.8	28.0	.17	41.0	49.6	.89				
		.12	6.8	2.6	10.0	8.1	42.7	.06	3.5	70.6					
Table test of 40 to 80 mesh ore:															
Heading.....	160	1.48	100.0	16.2	100.0	9.3	100.0	.14	100.0	44.2	2.46	100.0	.02	100.0	
Lead concentrate.....	31	20	52.8	24.5	8.8	12.1	3.2	.14	2.7	1.6					
Zinc concentrate.....	4	8.20	59.0	41.5	59.2	10.8	26.8	.33	54.5	6.0					
Zinc middling.....	21	.41	3.6	23.0	18.7	10.4	14.6	.08	7.6	33.0					
Tailing.....	77	.63	1.0	2.2	6.5	7.5	40.2	.71		70.4	.6	13.1	.01	24.0	
Roasting and separating zinc concentrate from above:															
Raw heading.....	Grams.	2.19	100.0	41.5	100.0	11.0	100.0	.28	100.0	6.2					
Roasted heading.....	1,700	2.01	83.7	42.0	94.1	11.0	92.8	.39	100.0	7.6					
Dust.....	1,120	5.33	10.3	16.5	2.7	7.4	4.6	.99	17.5	38.6					
First and second iron middlings.....	114	1.48	4.8	6.5	1.0	30.7	18.3	1.41	23.7	15.6	7.86		.06		
Third iron middling.....	72	2.96	6.1	17.5	1.7	26.7	10.0	3.70	31.8	13.6	17.28		.22		
First zinc concentrate.....		1.95		47.2		8.2		.11		6.6					
Second and third iron middlings.....	50	3.61	8.3	25.7	2.8	24.8	10.3	.44	5.1	10.6	13.42		.14		
Second zinc concentrate.....	1,415	1.42	58.6	49.5	98.0	7.7	57.0	.17	35.4	6.0					
Flotation of slime:															
Slime heading.....	500	1.72	100.0	14.1	100.0	8.8	100.0	.06	100.0	43.0	4.96	100.0	.06	100.0	
Concentrate.....	182	4.62	98.8	29.6	77.2	10.9	45.4	.11	80.0	17.6					
Tailing.....	302	.05	1.7	6.5	27.8	8.8	60.0	.05	60.0	60.2	1.23	14.9	.01	10.0	
Concentrate.....	74	11.30	97.3	33.5	35.2	9.3	15.6	.61	32.0	15.4					
Tailing.....	422	.12	5.9	11.0	65.9	.7	92.7	.06	84.0	48.0	2.04	34.6	.62	26.7	

SUMMARY OF THE MAGNETIC-SEPARATION TESTS.

A number of the less complex mixed-sulphide ores from mines in the western States have been tested for magnetic separation of the iron sulphide with varying degrees of success. Some of them give commercial grades of concentrate.

ROASTING ZINC SULPHIDE ORES.*

CHLORIDIZING ROASTING.

For some years previous to the inception of the work at the Salt Lake City station, various chloridizing processes had been popular in Utah. The large supplies of salt available in this State made chloridizing roasting and brine leaching a logical development in the metallurgical treatment of low-grade and complex ores. The plants of the Mines Operating Co. at Park City and of the Knight-Christensen Metallurgical Co. at Silver City were designed to remove copper, gold, and silver from the low-grade siliceous ores found in many of the western mining districts. Recovery of the lead, in addition to these three metals, had not received much attention, although some lead had been recovered in these plants. Therefore, the Salt Lake City station made a study of the action of the lead and zinc minerals during chloridizing-blast-roasting and leaching, as practiced in the above mills, with the object of determining whether the processes could be extended or modified in order to recover all of the lead and the zinc.

The results of the work on lead have been published by the Bureau of Mines in Bulletin 157.^b Seemingly, it should be easily possible to modify the processes used in order to make proper recovery of the lead.

The work with the zinc minerals was unsuccessful as only part of the zinc could be chloridized. The question of chloridizing oxidized zinc ores is discussed in another part of this bulletin (p. 120). As regards the zinc-sulphide ores, satisfactory roasting and chloridizing in either the Holt-Dern shaft roaster or the Knight-Christensen down-draft roaster seemed impossible. With an ore containing 5 per cent of zinc as the sulphide, in a quartz gangue, it was found that under the conditions prevailing in the blast roasters the zinc sulphide did not have time to roast, either in the presence or absence of salt. None to 12 per cent of the zinc would volatilize, probably as chlorides, and 5 to 35 per cent of the zinc in the calcine was soluble. Leaching with acidified brine would usually extract not more than half of the zinc in the calcine, including the water-soluble or chloridized zinc.

* Experimenters: W. G. Woolf, C. L. Larson, M. J. Udy, Walter Neal, R. W. Johnson, and J. F. Cullen.

^b Lyon, D. A., and Bakston, O. C., Innovations in the metallurgy of lead: Bull. 157, Bureau of Mines, 1916, pp.

To describe in detail the various tests made on this material would serve no useful purpose. The following brief summary will suffice:

The ore was roasted after being ground to many different sizes, varying from 8-mesh to 100-mesh material. The quantity of fuel used varied from 1 to 5 per cent, and the amount of salt from 3 to 10 per cent of the weight of the ore. The blast pressure was varied in order that temperatures of 600° to 900° C. could be obtained. The roasting period was varied from 15 minutes to 3 hours. In no test did it seem possible to roast more than 50 per cent of the zinc to a form soluble in acid brine. The chemical and physical properties of zinc sulphide are such that it usually roasts very slowly, and the brief time that the mineral is heated in an oxidizing atmosphere in the blast roasters used does permit complete roasting. With the shallow bed on the down-draft roaster, which gives a 15-minute roast, usually not more than 20 per cent of the zinc is oxidized or chloridized, and in many of the tests the total amount of zinc removed during such treatment was only about 5 per cent.

OXIDE ROASTING.

By oxide roasting is meant the roasting of zinc-sulphide ores to as low a percentage of sulphur as possible. As zinc sulphide is one of the most refractory of the major-metal sulphides to roast, advancement in the art of roasting these ores is far from satisfactory. However, no doubt considerable improvements will be made in mechanical contrivances for obtaining continuous roasting of such ores. The chief objection to existing types of furnaces is that when the roast is carried to the point of satisfactory elimination of sulphur the costs of building and operation are very high. For zinc-retort smelting it is important that no sulphur be left in the calcine. The statement has often been made that every pound of sulphur left in the calcine, restrains 2 pounds of zinc from distilling in the retorts.

For leaching the zinc calcine with sulphuric acid, complete desulphurization of the ore is not required but complete oxidation of the sulphides of zinc is necessary. In other words, the amount of zinc converted to sulphate of zinc is immaterial, as long as all of the sulphide of zinc is roasted. Usually the lower the temperature of roasting the greater is the percentage of zinc sulphate formed, but also the greater is the liability of leaving some unroasted zinc sulphide unless the time of roasting is extended over a long period. The higher the temperature of roasting the higher is the percentage of oxide of zinc formed, because zinc sulphate decomposes thermally at temperatures above 680° C. The desirability of making zinc sulphate will depend on the acid requirements of the ore during leaching. An electrolytic zinc process returns the used acid for leaching and only enough new acid need be added to bring the solution up to the desired strength and make up for mechanical losses.

SULPHATE ROASTING.

The principles of sulphate roasting of zinc sulphide in the ordinary reverberatory type of roaster are fairly well known, but the sulphating efficiency of blast roasters has not been generally tested. As chloridizing roasting had failed in the tests just described, sulphating roasting did not seem to be a very promising field for experiment. However, a few tests were made in the Holt-Dern laboratory roaster, running slowly and with a low blast. The low blast permitted a low temperature and a long roasting period, conditions which are necessary when attempting to form zinc sulphate. The quantity of water-soluble zinc after such a roast was nearly always small and rarely exceeded 10 per cent of the total zinc content. Hence the blast roaster is not adapted to such work.

In a series of oxidizing roasts of zinc-sulphide ores, made in a small gas-fired reverberatory roaster, many of the roasts were leached with water. The conditions of formation of zinc sulphate in a muffle are discussed in connection with that series of tests.

At Great Falls, Mont., the Anaconda-Wedge roaster is giving a 22-hour roast to complex sulphide ore, the temperature being about 600° C., and the ore being rabbled four times a minute. About 30 to 50 per cent of the zinc is sulphated. Marmatite ores give better results in sulphate roasting than "free" ores, possibly because of the catalytic effects of iron oxide in direct contact with the zinc oxide. The low temperature used is to prevent the breaking up of zinc sulphate and also the formation of ferrites of zinc.

An extensive series of roasting tests of various complex-sulphide ores containing zinc was made at varying temperatures and for different lengths of time to determine the best conditions for roasting such ores. At first a gas muffle furnace was used, the ore being placed on the bottom of the muffle. A platinum and platinum-rhodium thermocouple protected by alundum tubing was used to measure the temperatures in the furnace. It was soon found that roasting in such a furnace was of no value, as the ore next the bottom of the muffle became much hotter than that farther from the bottom. Hence the use of roasting dishes became necessary, and a gas reverberatory roasting furnace 2 feet by 3 feet in size, was used, to parallel more nearly the conditions in a commercial roaster.

The reason for studying roasts of this kind was that considerable trouble was then being experienced in the experimental electrolytic zinc plants at Anaconda, Mont.; Trail, B. C.; Murray, Utah; Welland, Ontario, and other places, in getting a calcine that was completely roasted. It seemed to be the common experience that in such calcines 60 to 70 per cent of the zinc would be acid-soluble;

the remainder was suspected to be largely sulphide of zinc, although ferrite of zinc was also known to be present. Chemical analyses showed sulphur left in the calcine. The question for determination was whether it would be possible, even by roasting in shallow dishes in a furnace of controlled temperature and with considerable rabbling, to calcine these ores in a short length of time, as can usually be done with copper ores in furnaces of this type. For instance, the Wedge zinc roaster can usually give the ore not more than 8 hours' roast, whereas the old Hegeler furnaces have been used for as much as a 60-hour roast. The more recent Anaconda-Wedge furnace gives a 20 to 22 hour roast.

A further point of interest was to determine the relative rates of roasting of lead and zinc sulphides in a mixed ore, as lead leaching was being tested at the same time in this laboratory. By treating the calcine with hot water the zinc sulphate formed could be leached and determined. In a similar way the total oxidized zinc could be determined by treatment with a solution of acetic acid (sulphuric acid tends to dissolve zinc sulphide slowly). The solution of acetic acid also leaches much of the oxidized lead. A solution of ammonium acetate dissolves lead sulphate, as does a saturated solution of sodium chloride. Finally, for practical purposes, a sulphuric acid leach to recover the total soluble (oxidized) zinc, followed by a brine leach to get the oxidized lead, was made.

ROASTING OF A LOW-IRON ORE FROM DALY-JUDGE MINE.

DESCRIPTION OF ORE AND OF METHOD USED.

The first ore to be roasted, known as sample 1, was from the Daly-Judge mine, of Park City, Utah. This sample represents a great deal of the Park City ore; it contained 16.88 per cent Zn, 14.87 per cent Pb, 2.25 per cent Fe, 10 per cent CaO, 30.8 per cent insoluble, and 12.7 per cent S. The sample was crushed to pass a Tyler standard 10-mesh screen and then gave the following screen analysis:

Results of screen analysis of Daly-Judge No. 1 ore crushed to pass a 10-mesh screen.

	Per cent.
On 20-mesh.....	21.8
On 35-mesh.....	19.8
On 65-mesh.....	15.0
On 100-mesh.....	8.8
On 150-mesh.....	5.4
On 200-mesh.....	6.2
Through 200 mesh.....	22.0

The curves in figure 2 show the percentages of the zinc and of the lead that were oxidized during the roasting of portions of this sample for different lengths of time at different temperatures. The roasts

were made in duplicate and the average of the two results taken. Oxidized zinc and lead were determined as previously described. The portions roasted weighed 300 grams each and were placed on clay roasting dishes 6 inches in diameter. At the end of each hour they were withdrawn, stirred, sampled, and returned to the furnace. The depth of the bed of ore being roasted was about 1 inch.

DISCUSSION OF RESULTS OF TEST.

The results show that 450°C. is too low a temperature for roasting either the sphalerite or the galena. At 550°C. little roasting takes place; at 675°C. roasting proceeds much more rapidly so that as much as 70 per cent of the zinc can be roasted in 10 hours, the greatest length of time that material can be held in the usual Wedge or McDougall type of roaster. Probably, more continuous rabbling would permit faster roasting at this temperature. The curve for the recovery of zinc at 900°C. is dotted to distinguish it from the curves

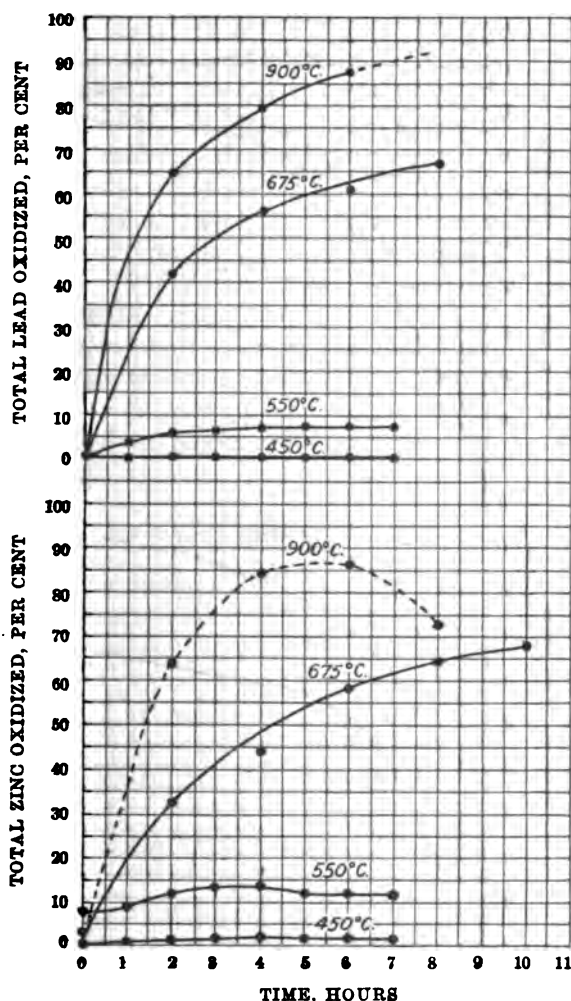


FIGURE 2.—Curves showing effect of temperature on speed of roasting, Daly-Judge No. 1 sample, 10-mesh size.

for the lower temperatures; for this curve a 10 per cent solution of sulphuric acid was used to determine the oxidized zinc in place of a 40 per cent solution of acetic acid. The sulphuric acid solution seems to dissolve some zinc sulphide as well as the oxidized zinc.

Perhaps the most striking feature brought out in figure 2 is that the speed of roasting both sphalerite and galena depends largely on the temperature; also, these two minerals seem to roast at about the

same rate of speed. The drop toward the end of the curve for zinc recovery at 900°C . is probably due to the formation of zinc ferrites or similar compounds, which are known to form at such a temperature. In fact, in roasting an ore containing much iron, past work has shown repeatedly that 750°C . is about the highest temperature

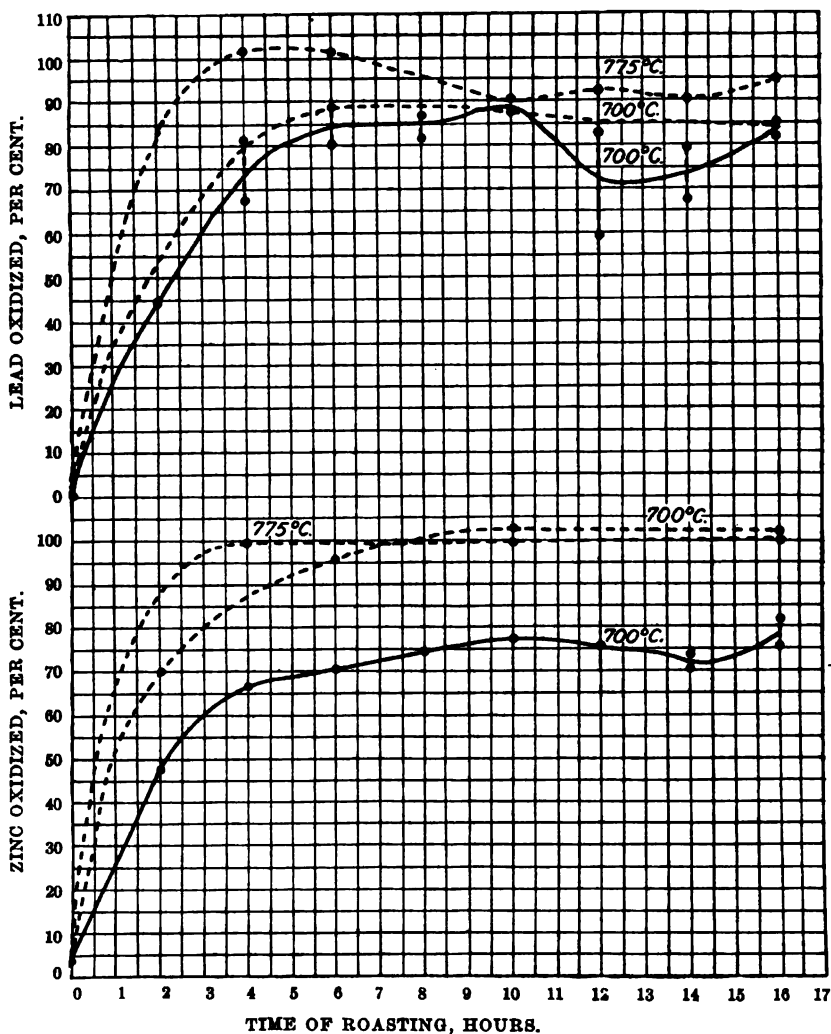


FIGURE 3.—Curves showing effects of leaching with different solvents, Daly-Judge No. 1 sample, 80-mesh size. Zinc: Solid-line curve, sulphuric acid solution; dotted curves, acetic acid solution. Lead: Solid-line curve, acidified ammonium acetate solution; dotted curves, acidified brine.

that can safely be used, in order to avoid the formation of ferrites. As much of the zinc is roasted to oxide and as ferrite forms on prolonged roasting, it might be possible to obtain quick roasting at high temperatures, provided the roast was discontinued promptly enough. This, of course, could apply only to ores low in iron.

LEACHING THE CALCINE.

As there was some doubt as to the relative value of sulphuric acid and acetic acid for recovering the zinc, and of acid ammonium acetate and acid brine for recovering the lead, comparative leaches were made on a calcine roasted at 700° C. of material ground to pass 80 mesh. The full-line curves in figure 3 give the recoveries with the acetic acid solvents, and the dotted lines, those for sulphuric acid and acid brine solvents, respectively. It can be seen that much more zinc is dissolved by the sulphuric acid solution than by the acetic acid solution, and that for practical purposes the leaches with acetic acid give low results. For this reason sulphuric acid is the leaching agent usually used in mills. In the same way a saturated brine, acidified with sulphuric acid, is a better solvent for the lead. Incidentally a roast at 775° C., the upper allowable limit of temperature, was made, with the result that practically all of the zinc was rendered soluble in sulphuric acid in less than four hours. Few of the commercial roasters will do such rapid work, and it would seem that roasters adapted to the use of very shallow beds of ore and to the use of finely divided ore might well be devised in order to obtain rapid roasting.

ROASTING OF A HIGH-IRON ORE FROM HONORINE MINE.

After roasting tests had been made with several sizes of this low-iron ore at different temperatures and for different lengths of time it was thought best to perform similar tests with an ore that was high in iron. Such an ore was available in the Honorine mine of the Bullion Coalition Mining Co., at Stockton, Utah; the sample obtained analyzed as follows: 13.1 per cent Zn, 10.56 per cent Pb, 22.2 per cent Fe, 30.32 per cent S, 18 per cent insoluble, and 2.42 per cent As.

The portions of this sample that were used for the tests to determine the effect of temperature and of length of roasting period gave the following screen analysis after preparation by crushing.

Results of screen analysis of ore from Honorine mine after crushing.

	Per cent.
On 20-mesh.....	2.6
On 35-mesh.....	24.1
On 65-mesh.....	22.4
On 100-mesh.....	10.6
On 150-mesh.....	7.8
On 200-mesh.....	5.5
Through 200-mesh.....	26.3

EFFECTS OF TEMPERATURE AND TIME OF ROASTING.

The lowest temperature investigated in this series of tests was 700°C ., as the lower temperatures had been shown to be unsatisfactory for roasting zinc and lead minerals. Figure 4 shows that during the first two hours more soluble zinc is formed by roasting at 800°C .

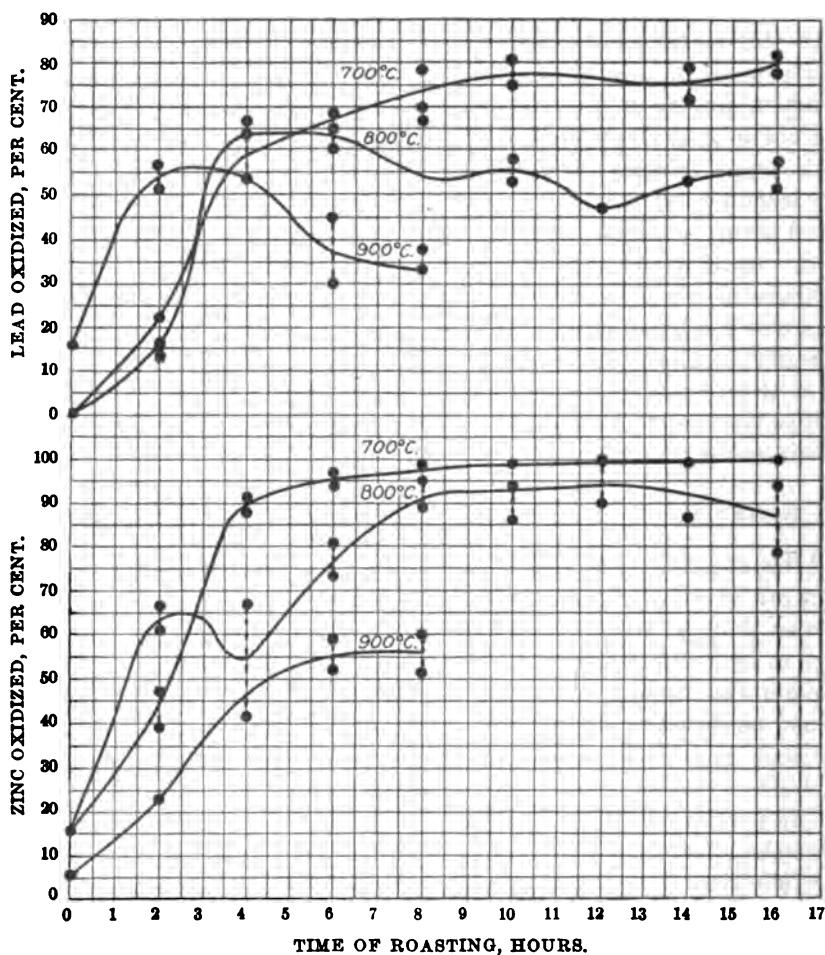


FIGURE 4.—Curves showing effects of temperature on speed of roasting; Bullion Coalition, No. 5 sample, 97.4 per cent passed 20-mesh.

than by roasting at 700°C ., owing to the more rapid roasting, but that after two hours the 800° roast contains less soluble zinc than the 700° roast, whereas the solubility of the zinc is very low after a 900° roast. This decrease in solubility was assumed to be due to the formation of ferrites, although the lead might be the cause of some of the trouble. However, as the lead did not cause any trouble in the first ore tested, this latter assumption is not regarded as probable. The

curves show that it is not safe to heat the ore much above 700° C. during the roasting. Moreover, some of the lead is rendered insoluble on long roasting at high temperatures and the lead recovery curves show a decided drop with increasing time. Practically all of the zinc is rendered soluble in about six hours' roasting at 700°, whereas nearly 10 hours' roasting seemed to be necessary for maximum solubility of the lead.

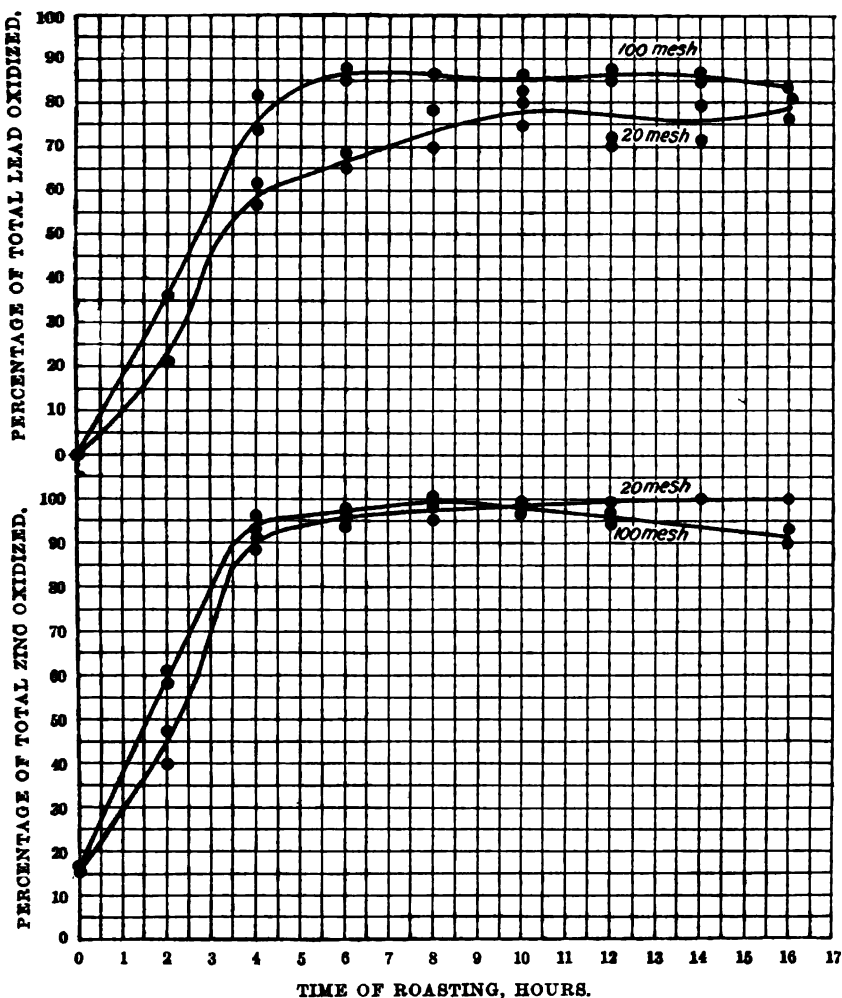


FIGURE 5.—Curves showing effects of size of ore on speed of roasting; Bullion Coalition, No. 5 sample, roasted at 700° C., 20-mesh and 100-mesh sizes.

EFFECTS OF FINENESS OF GRINDING.

Figure 5 shows the time-extraction curves for two roasts on material of different sizes, 20-mesh and 100-mesh. It is surprising how small a difference the size of the particles makes in the roasting of

sphalerite. The material ground to pass a 100-mesh screen showed the gradual formation of ferrite during the last eight hours of the roast. This seems reasonable, as the ore is more finely ground and there is a better chance for the sphalerite being in contact with pyrite during the roasting, with the resultant combination of iron oxide with zinc oxide as time goes on. As regards the galena, the lead recoveries from the 100-mesh material were markedly higher, after a given length of time, than the corresponding ones for 20-mesh material. The maximum percentage of lead rendered soluble by roasting 20-mesh material was about 80 per cent, whereas nearly 90 per cent was rendered soluble in the roasting of the 100-mesh material.

EXPERIMENTS TO DETERMINE EFFECTS OF LEAD.

In these tests it was suspected that some of the lead after roasting tended to form lead silicate. To obtain light on this point, a finely ground slime from the dump of the Horn Silver mine at Frisco, Utah, was roasted.

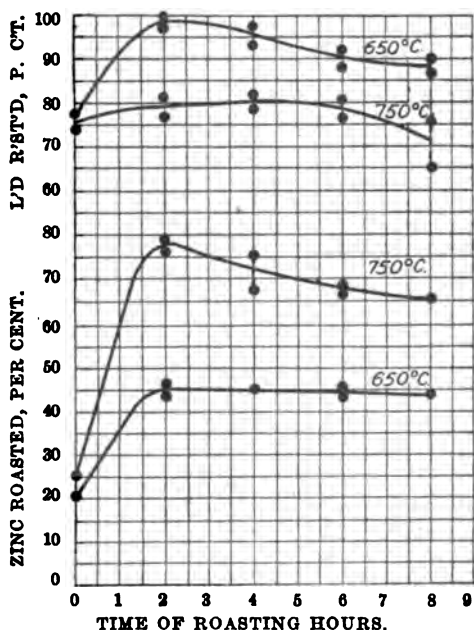


FIGURE 6.—Curves showing effects of temperature on solubility of zinc and lead in slime from Horn Silver dump, Frisco, Utah, 650 and 750° C.

This material had the following analysis: 6.3 per cent Zn, 7.4 per cent Pb, 53.6 per cent insoluble, 4.4 per cent Fe, 2.2 per cent CaO, 6.13 per cent S, and 8.5 per cent Al_2O_3 . The results of the two roasts made are plotted in figure 6. It can be seen that roasting at 650° C. renders practically all of the lead soluble in a very short time. Eighty per cent of the lead in this ore was oxidized before roasting and only 20 per cent of the zinc was oxidized. When the ore was roasted at 750° C., the solubility of the lead seemed to be less, although the recovery of zinc was much better,

than from roasting at 650° C. However, the formation of ferrite of zinc at 750° C. seems to be quite plainly indicated by the fall in the last two-thirds of the zinc curve for that temperature.

Similar curves for the roasting of a series of ores all of which contained both lead and zinc, at 750° C., are shown in figure 7. The analyses of these ores are given in Table 15. Bullion Coalition No. 1 sample is representative of a large tailing dump from a concentration

mill in which most of the zinc and lead sulphides had been removed from the pyritiferous gangue by gravity concentration. Bullion Coalition No. 2 sample is representative of a zinc-iron-lead middling product, made at this mill, which is run into the tailing. The American Flag No. 2 sample is representative of the partly oxidized ores of the Park City district of Utah, and the Daly-Judge No. 2 sample is representative of the deeper sulphide ores of that district when iron is present in larger amounts. The Ophir Hill No. 2 sample is of the slime tailing of the Ophir Hill mill at Ophir, Utah, not far from Stockton, where the Bullion Coalition mines are situated.

In general, the tests showed that for all of these ores the most favorable roasting temperature was 750° C. At this temperature the maximum proportion of soluble zinc obtained is formed in about four hours, if the roasting bed is not more than an inch deep. The same remark applies to the lead in these ores.

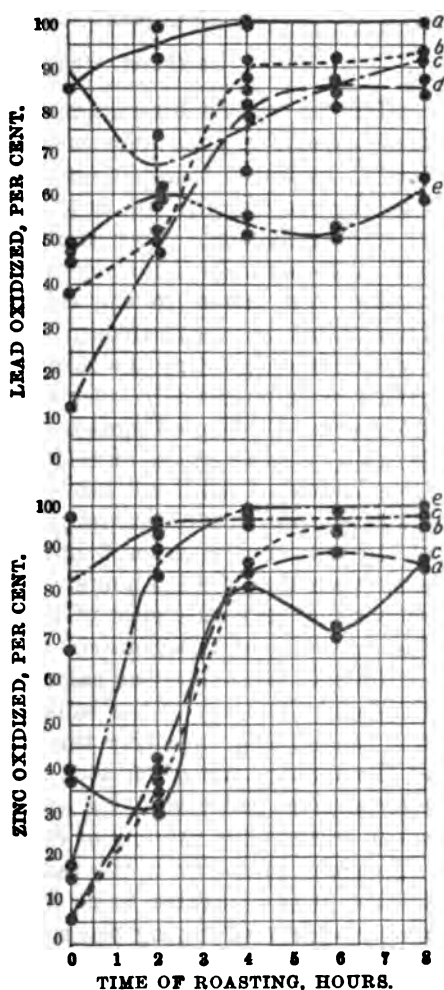


FIGURE 7.—Curves showing effects of roasting on solubility of zinc and lead in various ores, 750°C.: a, Bullion Coalition, No. 1 sample; b, Bullion Coalition, No. 2 sample; c, American Flag, No. 2 sample; d, Daly-Judge, No. 2 sample; e, Ophir Hill, No. 2 sample.

TABLE 15.—Results of analyses of zinc-lead sulphide ores.

Mine and sample.	Insoluble.	CaO.	Fe.	Al ₂ O ₃ .	Zn.	Pb.	Cu.	S.	CO ₂ .	As.	Mn
	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
Bullion Coalition, No. 1.....	10.5	2.1	33.0	7.6	4.4	3.0	0.10	37.34	3.53	1.13	.....
Bullion Coalition, No. 2.....	9.3	3.4	28.8	15.8	8.5	10.5	.07	35.86	.....	2.33	.....
American Flag, No. 2.....	73.9	4.7	1.1	4.4	6.9	4.2	.11	.40	5.24	.....	0.37
Daly-Judge, No. 2.....	22.0	5.1	16.4	1.9	12.0	15.4	.07	24.75	6.48	.20	.....
Ophir Hill, No. 2.....	51.5	5.0	4.3	.....	3.9	3.8	1.16	4.69	.....	.25	.....

LEACHING THE CALCINED ORE.

GENERAL METHOD USED IN TESTS.

After the best conditions for roasting the zinc in the ores had been determined the next step was to run larger leaching tests. As 750° C. had been found the best temperature, the experiments were made by roasting the ores at that heat and then leaching the calcines in 2.5-liter bottles. The calcines, before leaching, were ground to pass a 60-mesh sieve, in order that all lumps might be broken. Five leaches were made on the calcines of each roast, as follows: (1) Using the theoretical amount of sulphuric acid needed to dissolve the zinc and agitating the mixture for 1.5 hours; (2) using a slight excess of sulphuric acid over the theoretical amount and agitating 1.5 hours; (3) using a large excess of acid and agitating for 1.5 hours; (4) using a small excess of acid and leaching for 3 hours; (5) using a large excess of acid and leaching for 3 hours. This series was to determine whether an excess of acid was necessary for extracting all of the zinc and whether 3 hours' agitation would give any better extraction than did 1.5 hours. Previous work in the laboratory had shown that as a rule most of the zinc went into solution during the first few minutes of agitation.

The acid efficiency was calculated from the analyses of the solutions and the assay of the tailing. The percentage of zinc recovery was calculated from either the analysis of the solution or the assay of the tailing, and often as a check on the work from both. The recoveries as calculated by these two methods should serve as a check without the running of duplicate analyses.

In many of the tests the tailing from the acid leaches was again leached with saturated brine in order to remove the lead sulphate that had formed during the roasting or during the leaching of the zinc. Thus it was possible to determine whether an ore of mixed lead and zinc sulphides might be roasted, and the zinc and the lead leached separately.

TESTS OF ORE FROM DALY-JUDGE MINE.

The first ore treated was the Daly-Judge No. 1, previously described. The results of the leaching tests of this ore are given in Table 16. The first five tests seemed to indicate a slight advantage in treating the ore for 3 hours instead of for 1½ hours, but this is not true of the next five tests. In any event the difference is slight. The ore used up all of the acid when only the amount theoretically required to dissolve the zinc was added. Of course, some of the zinc sulphide had been roasted to sulphate, but the amount was small as determined a number of times by water leaches of the calcines. The temperature was high enough and the time of roasting long enough

TABLE 10.—*Results of leaching Daly Judge calcines.*

[Calcines from Daly Judge, No. 1, roasted at 750° C.]

Leach. No.	Time, hours.	Acid used.		Weight of sample, grams.	Per cent- age of zinc in heads.	Zinc, grams.			Zinc (per cent) recovered.		Iron, grams.		Acid efficiency.	Pulp ratio.	Lead in heads.		Quantity of brine used for leaching lead, c. c.	Time of leaching, hours.	Lead, grams.		Lead (per cent) recovered.
		Per cent.	Grams.			In heads.	In tails.	In solution.	By tails assay.	By solution.	In heads.	In solution.			Per cent.	Grams.			In tails.	In solution.	
1.....	1½	10	8.60	0.00	16.55	5.79	0.98	4.96	83.1	83.7	1.05	0.040	87.3	2	.....	.....	.....	.....	.....	.....	.....
2.....	1½	10	11.64	1.12	16.55	5.79	.868	5.16	83.1	80.2	1.05	.047	74.2	3	.....	.....	.....	.....	.....	.....	.....
3.....	1½	10	20.31	9.84	16.55	5.79	.812	5.21	86.2	80.1	1.05	.065	75.2	5	.....	.....	.....	.....	.....	.....	.....
4.....	3	10	11.64	.616	16.55	5.79	.729	4.76	87.3	82.3	1.05	.075	65.1	3	.....	.....	.....	.....	.....	.....	.....
5.....	3	10	20.31	9.10	16.55	5.79	.648	5.25	88.8	80.7	1.05	.080	70.7	5	.....	.....	.....	.....	.....	.....	.....
1-4.....	1½	10	8.75	.00	16.55	5.79	1.29	4.62	77.8	79.8	1.05	.066	70.9	2	.....	.....	.....	.....	.....	.....	.....
2-4.....	1½	10	11.78	1.494	16.55	5.79	.99	4.84	82.7	83.6	1.05	.065	68.9	3	.....	.....	.....	.....	.....	.....	.....
3-4.....	1½	10	20.00	9.10	16.55	5.79	.82	4.92	85.7	84.9	1.05	.075	63.8	5	.....	.....	.....	.....	.....	.....	.....
4-4.....	3	10	11.78	1.122	16.55	5.79	1.12	4.84	80.6	83.6	1.05	.075	63.8	3	.....	.....	.....	.....	.....	.....	.....
5-4.....	3	10	20.00	8.86	16.55	5.79	.91	4.88	84.3	84.3	1.05	.079	62.0	5	.....	.....	.....	.....	.....	.....	.....

TABLE 17.—Results of leaching calcines from the roasting of Bullion Coalition No. 5 ore.

ROASTED AT 760° C. FOR 4 HOURS ON BOTTOM OF FURNACE.

Leach No.	Time, hours.	Acid used.		Free acid, grams.	Weight of sample, grams.	Per-cent- age of zinc in heads.	Zinc (grams) in—			Zinc (per cent) recovered by—	Iron (grams) in—		Acid effi- ciency.	Pulp ratio.	Lead in heads.		Brine, c. c.	Time of leaching, hours.	Lead (grams) in—		Lead (per cent) recovered by—	
		Per cent.	Grams.				Heads.	Tails.	Solu- tion.		Heads.	Tails.			Solu- tion.	Per cent.			Grams.	Solu- tion.		Tails.
1	1½	10	8.11	1.04	35	13.47	4.71	1.33	3.71	78.8	9.50	0.084	2	9.6	3.36	350	2	0.45	2.83	86.6	84.2	
2	1½	10	11.11	4.25	35	13.47	4.71	.96	3.71	78.8	9.50	.103	3	9.6	3.36	350	2	.53	2.82	84.2	83.9	
3	1½	10	20.00	13.20	35	13.47	4.71	1.17	3.64	75.0	9.50	.089	5	9.6	3.36	350	2	.59	2.82	82.4	82.8	
4	3	10	11.11	4.09	35	13.47	4.71	1.09	3.72	76.8	9.50	.101	3	9.6	3.36	350	2	.52	2.96	84.5	85.1	
5	3	10	20.00	12.92	35	13.47	4.71	1.13	3.66	75.9	9.50	.103	5	9.6	3.36	350	2	.56	2.78	83.4	82.8	

ROASTED AT 760° C. FOR 4 HOURS IN CLAY DISHES.

1-a	1½	10	7.64	1.00	35	14.5	5.08	2.03	3.30	60.0	65.0	0.087	9.38	3.28	360	2	1.42	56.7
2-a	1½	10	10.87	4.46	35	14.5	5.08	1.99	3.33	60.8	65.5	0.0913	9.38	3.28	360	2	1.36	56.6
3-a	1½	10	20.00	13.25	35	14.5	5.08	1.97	3.41	61.2	65.8	0.082	9.38	3.28	360	2	1.35	56.8
4-a	3	10	10.87	3.94	35	14.5	5.08	1.86	3.41	63.4	65.8	0.1150	9.38	3.28	360	2	1.33	56.4
5-a	3	10	20.00	13.05	35	14.5	5.08	1.81	3.43	64.3	65.8	0.1265	9.38	3.28	360	2	1.30	56.7

ROASTED AT 760° C. FOR 6 HOURS IN CLAY DISHES.

1-b	1½	10	7.85	1.44	35	14.85	5.20	1.46	4.04	71.6	77.8	0.075	9.17	3.26	350	2	1.00	69.4
2-b	1½	10	10.87	4.53	35	14.85	5.20	1.38	4.06	73.5	78.2	0.084	9.17	3.26	350	2	0.87	68.4
3-b	1½	10	20.00	13.66	35	14.85	5.20	1.41	4.14	73.0	79.7	0.089	9.17	3.26	350	2	0.92	71.8
4-b	3	10	10.87	4.52	35	14.85	5.20	1.43	4.08	72.6	78.6	0.092	9.17	3.26	350	(a)	1.05	67.8
5-b	3	10	20.00	13.58	35	14.85	5.20	0.93	4.20	84.1	80.8	0.094	9.17	3.26	350	2	0.77	76.4

a Not agitated.

TABLE 18.—*Results of leaching calcines from chloridizing roast of Bullion Coalition No. 5 ore.*

[Roasted at 750° C. for 4 hours in clay dishes with 10 per cent salt.]

Leach No.	Time, hours.	Acid used.		Weight of sample, grams.	Per-cent- age of zinc in heads.	Zinc (grams) in—			Zinc (per cent) recovered by—	Iron (grams) in—	Add efficiency.	Pulp ratio.	Lead in heads.		Brine, c. c.	Time of leaching, hours.	Lead (grams) in—		Lead (per cent) recovered by—	
		Per cent.	Grams.			Heads.	Tails.	Solu- tion.		Tails assay.	Heads.		Per cent.	Grams.			Tails.	Solu- tion.	Tails assay.	Solu- tion.
10	1½	10	8.04	5.78	35	4.35	3.05	1.04	28.9	23.9	8.82	0.0655	6.08	2.12	350	2	0.102	2.00	94.9	94.3
20	1½	10	10.87	8.90	35	4.35	3.05	1.04	28.9	23.9	8.82	.0780	6.08	2.12	350	2	.077	2.03	94.2	93.8
30	1½	10	20.00	17.80	35	4.35	2.86	1.02	34.2	23.4	8.82	.0755	6.08	2.12	350	2	.077	2.01	94.2	94.9
40	3	10	10.87	8.90	35	4.35	2.66	1.06	34.8	24.8	8.82	.0680	6.08	2.12	350	2	.082	2.00	94.2	94.3
50	3	10	20.00	18.30	35	4.35	3.10	1.10	28.7	25.3	8.82	.0605	6.08	2.12	350	2	.085	2.08	94.6	96.8

so that usually most of the zinc sulphate formed was broken up. With this ore the recovery of zinc possible by the method of leaching used is apparently about 85 per cent, and the acid efficiency varies from about 65 to 75 per cent. About 80 per cent of the lead can be recovered from the tailing by leaching with saturated brine for two hours.

TESTS OF ORE FROM BULLION COALITION MINE.

The Daly-Judge ore was roasted on clay roasting dishes. In testing the Bullion Coalition No. 5 ore, roasting both in dishes and on the bottom of the muffle was tried. The results of these two tests, presented in Table 17, show that roasting on the bottom of the muffle was fairly successful, whereas roasting in dishes gave low recoveries, both of the zinc and of the lead. As it was thought that the temperature of roasting had been too high, another roast was made (see Table 17) at 700° C. and for a longer period (6 hours). The zinc recovery was better, but the lead recovery was somewhat low. This ore is difficult to roast on account of the large content of pyrite; seemingly the best recovery possible is about 75 per cent of the zinc and about 80 per cent of the lead, with about 80 per cent acid efficiency. For removing zinc from the calcines a 3-hour leach seems to show little improvement over a 1½-hour leach.

EFFECTS OF ROASTING WITH SODIUM CHLORIDE.

As some success was had in the removal of lead from such mixed sulphide ores by roasting with sodium chloride in tests reported under the subject of "Lead in complex sulphides," one roast was made in this series of tests in which 10 per cent of common salt was added to the ore. As a result of adding the salt (see Table 18), only a small proportion of the zinc sulphide was converted to soluble form, but the lead sulphide was rendered almost completely soluble. This result is much like that obtained in the work on lead, except that with a blast roaster the lead can be almost entirely converted to soluble form in the presence of zinc sulphide, whereas usually only 4 to 10 per cent of the zinc sulphide is converted. On that account salt is evidently not a desirable addition product in reverberatory roasting of sphalerite.

TREATMENT OF LOW-LEAD MILL PRODUCTS.

Next a series of roasts were made on mill products that did not contain lead in important amounts. Two samples of zinc concentrates of relatively high grade, one from Joplin, Mo., and the other from Midvale, Utah, were roasted and leached, to determine what recoveries of zinc might be expected under the conditions in the laboratory roaster. Also, a sample of zinc-iron middling from the

wet-concentration mill at Midvale and a sample of ore from the Wasa mine at Hall, Mont., were treated. The Wasa mine ore contains most of the zinc as marmetite, the double sulphide of zinc and iron, in which iron sulphide is thought to be present in solid solution in the zinc sulphide.

The analyses of these four products is given in Table 19, and the screen analyses of the products that were roasted are presented in Table 20.

TABLE 19.—*Results of analyses of four zinc products low in lead.*

Ore.	Insoluble.	CaO.	Fe.	Zn.	Pb.	Cu.	S.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Joplin blende concentrates.....				86.2			
Midvale blende concentrates.....			5.33	55.6	1.86	1.16	28.96
Midvale zinc-iron middlings.....			24.87	28.25	3.66	1.00	28.66
Wasa mine ore.....	37.5	1.37	20.30	15.1	0.71	1.60	21.96

TABLE 20.—*Results of screen analyses of zinc ores and concentrates low in lead.*

Size of mesh.	Missouri zinc blende.	Midvale zinc blende.	Midvale zinc-iron middling.	Wasa mine ore.
On 20-mesh..... per cent.	7.8			
On 35-mesh..... do.	32.2			18.4
On 65-mesh..... do.	27.8	2.8	7.2	27.8
On 100-mesh..... do.	11.8	23.2	24.2	11.4
On 150-mesh..... do.	4.4	20.8	18.8	4.6
On 200-mesh..... do.	7.2	33.2	23.2	9.0
Through 200-mesh..... do.	8.6	18.6	25.8	28.6

The high-grade concentrate from Joplin, Mo., was almost pure blende of a beautiful orange hue, and any failure to recover all of the zinc could only be due to incomplete roasting. This test gave a measure of the success of the roasting tests that are recorded here. As can be seen from Table 21, roasting this material at 750° C. for five hours rendered only 89 per cent of the total zinc soluble in the leaching solutions. The conclusion is that the roast must have been incomplete. The tailing would have to be reroasted if this were the best work that could be done on a single roast. The work of nearly everyone who has roasted this type of material has shown that well above 95 per cent of the total zinc content can be rendered soluble by sufficiently lengthening the time of the roast, and on that account little apprehension need be had over any necessity of reroasting the residuc. Also, in these tests an acid efficiency of more than 90 per cent was attained.

TABLE 21.—*Leaching zinc blende from Joplin, Mo., after roasting.*

[Roasted at 750° C. for 5 hours.]

Leach No.	Time, hours.	Acid used.		Free acid, grams.	Weight of sam-ple, grams.	Percent- age of zinc in heads.	Zinc (grams) in—		
		Per cent.	Grams.				Heads.	Tails.	Solutions.
1.....	1½	10	26.18	2.2	25	66.2	16.56	2.02	14.3
2.....	1½	10	31.40	7.5	25	66.2	16.56	1.99	14.8
3.....	1½	10	41.80	17.0	25	66.2	16.56	1.90	14.42
4.....	3	10	31.40	7.4	25	66.2	16.56	2.01	14.80
5.....	1½	10	41.80	17.6	25	66.2	16.56	2.01	14.68

Leach No.	Time, hours.	Acid used.		Zinc (per cent) recovered by—		Iron (grams) in—		Acid efficiency.	Pulp ratio.
		Per cent.	Grams.	Tails assay.	Solution.	Heads.	Solution.		
1.....	1½	10	26.18	87.2	86.4	0.5	0.035	90.1	9
2.....	1½	10	31.40	88.0	89.4	0.5	0.042	93.5	11
3.....	1½	10	41.80	88.5	87.2	0.5	0.035	87.8	15
4.....	3	10	31.40	87.8	89.4	0.5	0.044	93.1	11
5.....	1½	10	41.80	87.8	88.6	0.5	0.037	91.5	15

The roast of the Midvale blende concentrate, as seen in the first part of Table 22, was more successful, possibly because it was finer than the Missouri concentrate. Extractions of more than 96 per cent were obtained, and the acid efficiency was practically 100 per cent. Any lead present was rendered almost completely soluble in brine solution. The lack of agreement between the solution recoveries and the removal of lead as indicated by the analysis of the tailing indicate that about 25 per cent of the lead had volatilized during the roast. The success of this roast showed that with proper grinding the conditions of roasting chosen were designed to give high recoveries of the zinc and the lead.

In the treatment of the middlings from Midvale the recovery of zinc was not so high, possibly through the formation of ferrites during roasting. The results are given in the second part of Table 22. Practically all of the lead, which was present in small amount, was recovered by leaching in brine solution following the sulphuric-acid leaching for zinc.

TABLE 22.—Results of leaching zinc-blends concentrate and zinc-iron middlings from Mibvale, Utah, after roasting.

ZINC BLENDE CONCENTRATE.

[Roasted at 750° C. for 5 hours.]

Leach No.	Time, hours.	Acid used.		Weight of sample, grams.	Per cent. of zinc in heads.	Zinc (grams) in—			Zinc (per cent) recovered by—		Iron (grams) in—		Lead in heads.		Brine, c. c.	Time of leaching, hours.	Lead (grams) in—		Lead (per cent) recovered by—	
		Per cent.	Grams.			Heads.	Tails.	Solution.	Tails assay.	Solution.	Heads.	Tails.	Per cent.	Grams.			Tails.	Solution.	Tails assay.	Solution.
6	1½	10	22.35	1.5	57.2	14.30	0.33	13.8	97.4	96.6	1.49	0.042	8	0.37	100	48	0.016	0.272	94.5	73.4
7	1½	10	20.18	5.6	57.2	14.30	.32	13.8	97.7	96.6	1.49	.035	9	.37	100	48	.014	.280	96.2	75.7
8	1½	10	41.80	20.6	57.2	14.30	.34	13.8	97.6	96.6	1.49	.044	15	.37	100	48	.008	.280	97.8	75.7
9	3	10	20.18	5.7	57.2	14.30	.36	13.8	97.5	96.6	1.49	.042	9	.37	100	48	.017	.252	95.4	68.2
10	1½	10	41.80	21.4	57.2	14.30	.30	13.92	97.9	97.4	1.49	.044	15	.37	100	48	.006	.280	98.3	75.7

ZINC-IRON MIDDINGS.

Leach No.	Time, hours.	Acid used.		Weight of sample, grams.	Per cent. of zinc in heads.	Zinc (grams) in—			Zinc (per cent) recovered by—		Iron (grams) in—		Lead in heads.		Brine, c. c.	Time of leaching, hours.	Lead (grams) in—		Lead (per cent) recovered by—	
		Per cent.	Grams.			Heads.	Tails.	Solution.	Tails assay.	Solution.	Heads.	Tails.	Per cent.	Grams.			Tails.	Solution.	Tails assay.	Solution.
11	1½	10	11.30	2.9	28.7	7.18	1.22	6.33	83.0	88.2	7.63	0.028	4.0	0.96	100	48	0.033	0.770	94.3	80.2
12	1½	10	15.84	7.1	28.7	7.18	1.54	6.46	73.6	90.0	7.63	.080	5.5	.96	100	48	.046	.794	93.2	81.6
13	1½	10	20.83	11.6	28.7	7.18	1.59	6.46	77.8	90.2	7.63	.083	7.5	.96	100	48	.007	.796	99.2	82.8
14	3	10	15.84	5.6	28.7	7.18	1.57	6.45	76.8	90.2	7.63	.080	6.0	.96	100	48	.026	.773	97.3	81.0
15	1½	10	20.86	13.3	28.7	7.18	1.59	6.46	77.9	90.0	7.63	.080	7.5	.96	100	48	.027	.832	97.3	86.6

TESTS OF MARMATITE ORE FROM WASA MINE.

Roasting and leaching of the marmatite ore from the Wasa mine gave low recoveries of the zinc; the maximum recovery possible seemed to be about 75 per cent. A 3-hour contact with excess of acid failed to dissolve any more zinc and only used up more acid, reducing the acid efficiency from 100 per cent, as indicated by a 1.5-hour leach, to 83 per cent. Low zinc recoveries are to be expected from such ore, on account of the intimate contact of iron and zinc in the mineral. Practically ideal conditions exist in this ore for the formation of zinc ferrite from the iron and zinc oxides formed in roasting, as the purest piece of blende contained about 12 per cent iron. A number of other roasts of this ore were tried, the results of which need not be recorded in this paper, but seemingly no better recoveries of the zinc could be obtained. The data for the first test are given in Table 23.

TABLE 23.—Results of leaching ore from Wasa mine, after roasting at 750°C. for 4 hours.

Leach No.	Time, hours.	Acid used.		Free acid, grams.	Weight of sample, grams.	Percent- age of zinc in heads.	Zinc (grams) in—		
		Per cent.	Grams.				Heads.	Tails.	Solu- tion.
1.....	1½	10	4.86	1.20	25	12.85	3.21	1.01	2.45
2.....	1½	10	7.48	3.81	25	12.85	3.21	1.00	2.47
3.....	1½	10	10.00	5.94	25	12.85	3.21	1.04	2.47
4.....	16	10	7.48	2.91	25	12.85	3.21	.98	2.48
5.....	3	10	10.00	5.61	25	12.85	3.21	.935	2.48

Leach No.	Time, hours.	Acid used.		Zinc (per cent) recovered by—		Iron (grams) in—		Acid efficiency.	Pulp ratio.
		Per cent.	Grams.	Tails assay.	Solu- tion.	Heads.	Solu- tion.		
1.....	1½	10	4.86	68.6	76.3	5.24	0.0304	101.0	2
2.....	1½	10	7.48	68.8	76.9	5.24	.0421	101.5	3
3.....	1½	10	10.00	67.6	76.9	5.24	.0374	91.8	4
4.....	16	10	7.48	71.0	77.6	5.24	.0177	82.1	3
5.....	3	10	10.00	70.8	77.6	5.24	.0608	83.4	4

The conclusions are that with pure blende ground to pass about 60 mesh, practically all of the zinc can be roasted to a form soluble in sulphuric acid in two to five hours at 750° C., the time of roasting depending on the depth of ore bed used. Where zinc and iron are intimately combined, as in a marmatite ore, it is very hard to get all the zinc into a form soluble in acid, on account of ferrites of zinc forming. If the zinc and the iron in a mixed-sulphide ore are present as a mechanical mixture of pyrite and sphalerite, less ferrite is formed and recoveries of at least 90 per cent of the zinc are possible after a roast of the kind described. Most of these conclusions are not new, but there have not been much data on record to support them; the results presented here will make the truth more evident.

TESTS OF PARTLY OXIDIZED ORES.

As regards partly oxidized ores containing zinc sulphide, the question is whether such ores can be roasted in order to oxidize the sulphide of zinc, while the oxidized minerals of zinc remain unaffected, as far as their reaction toward sulphuric acid is concerned. A prominent example of such partly oxidized ore is that in the Lower Mammoth mine, of Mammoth, Utah.

ORE FROM LOWER MAMMOTH MINE.

Two samples of this ore were treated by roasting. Both of these were almost pure white, claylike material, much decomposed by weathering, and seemed to be completely oxidized, as far as the eye could distinguish. Such an ore would be almost impossible to leach if treated direct, on account of filtering difficulties, but would not be hard to leach after roasting, as the heat breaks up the "colloidal" material in the ore so that it can be filtered. The screen analyses of these two samples are given in Table 24. The results of the tests are shown in Tables 25 and 26.

TABLE 24.—Results of screen analysis of two samples of partly oxidized ore from Lower Mammoth mine, Mammoth, Utah, after roasting.

Size of mesh.	No. 1.	No. 2.
On 20-mesh.....per cent..	15.8	....
On 35-mesh.....do....	30.4	25
On 65-mesh.....do....	45.0	68.4
On 100-mesh.....do....	2.4	2.4
On 150-mesh.....do....	1.8	0.6
On 200-mesh.....do....	1.6	1.6
Through 200-mesh.....do....	1.8	14

TABLE 25.—Results of roasting and leaching partly oxidized zinc ore, Lower Mammoth No. 1.

(Roasted at 750° C. for 4 hours.)

Leach No.	Time, hours.	Acid used.		Free acid, grams.	Weight of sample, grams.	Zinc (per cent) in heads.	Zinc (grams) in—			Zinc (per cent) recovered by—		Iron (grams) in—	
		Per cent.	Grams.				Heads.	Tails.	Solution.	Tails assay.	Solution.	Heads.	Solution.
1.....	14	10	2.57	0.00	35	7.50	2.63	1.06	1.40	60.0	53.1	4.58	0.007
2.....	14	10	5.00	.68	35	7.50	2.63	.86	1.53	67.0	58.0	4.58	.028
3.....	14	10	20.00	15.32	35	7.50	2.63	.86	1.59	67.0	60.0	4.58	.035
4.....	2	10	5.00	.40	35	7.50	2.63	1.08	1.60	59.0	60.0	4.58	.023
5.....	3	10	20.00	15.24	35	7.50	2.63	1.10	1.60	58.0	60.0	4.58	.035

Leach No.	Time, hours.	Acid efficiency.	Pulp ratio.	Lead in heads.		Brine used in leaching for lead, c.c.	Time of leaching with brine, hours.	Lead (grams) in—		Lead (per cent) recovered by—	
				Per cent.	Grams.			Tails.	Solution.	Tails assay.	Solution.
1.....	14	82.1	0.70	1.77	0.62	100	2	0.554	0.10	10.6	16.15
2.....	14	81.2	1.25	1.77	.62	100	2	.411	.126	33.7	20.30
3.....	14	81.3	5.00	1.77	.62	100	2	.340	.123	45.2	19.90
4.....	3	82.6	1.25	1.77	.62	100	2	.362	.123	41.7	19.90
5.....	3	80.9	5.00	1.77	.62	100	2	.345	.147	46.0	23.70

TABLE 26.—*Roasting and leaching partly oxidized zinc ore, Lower Mammoth No. 2.*

[Roasted at 750° C. for 4 hours.]

Leach No.	Time, hours.	Acid used.		Free acid, grams.	Weight of sample, grams.	Zinc (per cent) in heads.	Zinc (grams) in—		
		Percent.	Grams.				Heads.	Tails.	Solution.
6.....	1½	10	5.20	0.00	35	11.45	4.00	1.13	2.75
7.....	1½	10	10.00	3.64	35	11.45	4.00	1.16	2.82
8.....	1½	10	20.00	13.68	35	11.45	4.00	1.15	2.83
9.....	3	10	10.00	3.44	35	11.45	4.00	1.11	2.82
10.....	3	10	20.00	13.16	35	11.45	4.00	1.01	2.89

Leach No.	Time, hours.	Zinc (per cent) recovered by—		Iron (grams) in—		Acid efficiency.	Pulp ratio.	Lead (per cent) in heads.
		Tails assay.	Solution.	Heads.	Solution.			
6.....	1½	72.0	68.8	1.77	0.009	79.8	1.3	0.00
7.....	1½	71.0	70.5	1.77	.023	67.0	2.5	.00
8.....	1½	71.3	73.2	1.77	.033	69.9	5.0	.00
9.....	3	72.3	73.0	1.77	.026	67.3	2.5	.00
10.....	3	74.7	72.3	1.77	.030	63.8	5.0	.00

With neither sample did it seem possible to roast the ore to advantage under the conditions that usually give good results in the treatment of zinc sulphide. The oxidized zinc minerals were so intimately associated with the oxidized iron minerals that the formation of ferrites in roasting was suspected; therefore a series of roasts were made to determine whether more careful roasting would take care of this difficulty. A quantity of ore was placed on a roasting dish and put into a cold muffle furnace. The temperature was gradually raised and the ore was rabbled intermittently. Grab samples of the calcines were taken at intervals, and these were treated with dilute sulphuric acid to determine the total amount of soluble zinc.

The effect of temperature on the solubility of the zinc is shown by the upper curve in figure 8, where the gradual temperature rise is plotted on one axis and the percentages of soluble zinc, as determined by the analysis of the solutions from the grab samples, on the other. At the same time, observations were made of the amounts of soluble iron. The sharp peak in the solubility curve for zinc illustrates how extremely sensitive this ore is to heat treatment. Heating the ore much above 700° C. seemed to cause the formation of insoluble zinc compounds, probably ferrites. The great amount of work, by other investigators, on the formation of zinc ferrites points to their being the cause of this decrease in solubility. All past experience has shown that in roasting such ore, zinc ferrites commence to form at a temperature slightly above 700° C. The increase in solubility up to that point is doubtless due to the desulphurization of the zinc sulphide present. This ore roasts rather slowly until a temperature above 600° C. is reached, and then, later, slight overheating above 700° C.

may spoil the calcine for leaching purposes. This is the most prominent instance of the formation of ferrites with which the writers are familiar.

The solubility curve for the iron is even more interesting. As is well known, pyrite becomes more soluble in acids on heating to a

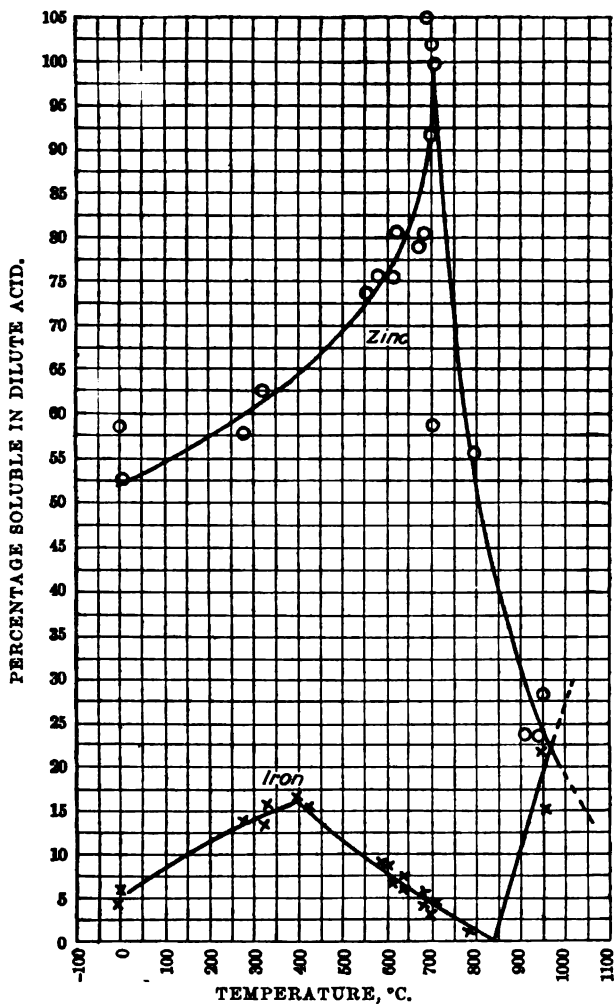


FIGURE 8.—Curves showing effects of roasting on solubility of zinc and iron in semioxidized zinc ore from Lower Mammoth mine.

temperature hot enough to drive off some of the sulphur. Thus the rising solubility of the iron may be due either to this heating or to the partial desulphurization of the pyrite. However, the greater proportion of the iron in this ore is present as oxidized minerals, and these are rendered less soluble in dilute acids by heating. The downward trend of the curve at temperatures above 400° C. is

TABLE 27.—Results of roasting and sulphuric acid leaching, ore from Wasa mine.

Test No.	Roasting period, hours.	Tem- per- ature, °C.	Loss of weight in roast- ing, per cent.	Time of leach- ing, hours.	Acid (H ₂ SO ₄) added at start.		Free H ₂ SO ₄ at finish, grams.	Weight of ore, grams.	Zinc (per cent) in—		Zinc (grams) in—			Zinc (per cent) recovered in—	
					Per cent.	Grams.			Heads.	Calcline.	Heads.	Tails.	Solu- tion.	Solu- tion.	Calcline.
1.....	2	750	14.2	1.5	8.9	16.89	8.98	35	12.9	14.5	5.075	.....	4.11	81.0	24.2
2.....	3	750	14.4	1.5	8.9	16.89	8.90	35	12.9	14.5	5.075	.....	4.02	79.2	24.2
3.....	4	750	14.6	1.5	8.9	16.89	8.90	35	12.9	14.5	5.075	.....	4.03	79.5	24.3
4.....	5	750	15.1	1.5	8.9	16.89	8.90	35	12.9	14.5	5.075	.....	3.99	78.6	34.4
5.....	7	750	15.3	1.5	8.9	16.89	8.90	35	12.9	14.5	5.075	.....	3.92	77.3	24.5
6.....	2	730	13.6	1	8.9	14.61	7.61	35	12.9	14.95	5.230	.....	3.79	72.4	24.2
7.....	3	730	14.6	1	8.9	14.61	6.70	35	12.9	15.10	5.280	.....	4.16	78.8	24.4
8.....	4	730	15.3	1	8.9	14.61	7.42	35	12.9	15.20	5.320	.....	4.03	76.0	24.4
9.....	2	730	13.6	1	8.9	11.25	4.33	35	12.9	14.95	5.230	.....	4.03	77.2	24.2
10.....	3	730	14.6	1	8.9	11.25	8.49	35	12.9	15.10	5.280	.....	4.11	77.8	24.4
11.....	4	730	15.3	1	8.9	11.25	4.71	35	12.9	15.20	5.320	.....	5.24	98.5	24.4
12.....	2	850	.....	1.5	11.5	11.5	5.81	35	.....	.....	4.65	2.94	1.90	40.9	.....
13.....	4	850	.....	1.5	11.5	11.5	5.99	35	.....	.....	4.65	2.76	2.26	49.1	21.6
14.....	6	1,050	.....	1.5	11.5	11.5	6.54	35	.....	.....	4.87	2.70	2.26	46.8	21.5
15.....	3	720	14.5	15	11.4	11.4	3.20	35	.....	.....	4.93	1.25	4.30	87.3	21.5
16.....	4	720	14.5	15	11.4	11.4	2.87	35	.....	.....	4.93	1.25	4.32	87.7	21.5
17.....	5	720	14.5	15	11.4	11.4	3.05	35	.....	.....	4.93	1.25	4.30	85.3	21.5
18.....	5	720	15.5	15	11.4	11.4	2.87	35	.....	.....	4.93	1.34	4.10	83.2	21.5
19.....	6	720	15.5	15	11.4	11.4	3.09	35	.....	.....	4.93	1.36	4.22	85.7	21.5

Test No.	Roasting period, hours.	Temperature, °C.	Loss of weight in roasting, per cent.	Iron (grams) in calcine.	Iron in solution.		Copper in calcine.		Copper in solution.		Pulp ratio.	Add efficiency, per cent.	Zinc in solution, per cent.	Remarks.
					Per cent.	Grams.	Per cent.	Grams.	Per cent.	Grams.				
1.....	2	750	14.2	8.47	0.070	0.105	0.23	0.08	0.04	0.061	4.3	78.7	2.7	
2.....	3	750	14.4	8.47	.073	.110	.23	.08	.04	.061	4.3	78.0	2.7	
3.....	4	750	14.6	8.50	.075	.112	.23	.08	.04	.061	4.3	78.5	2.7	
4.....	5	750	15.1	8.54	.081	.123	.24	.08	.04	.061	4.3	75.4	2.7	
5.....	7	750	15.3	8.57	.077	.115	.24	.08	.04	.061	4.3	74.3	2.6	
6.....	2	730	13.6	8.47	.077	.101	.23	.08	.05	.061	3.7	81.8	.....	
7.....	3	730	14.6	8.55	.111	.111	.23	.08	.06	.055	2.9	79.5	.....	
8.....	4	920	15.3	8.55	.123	.160	.24	.08	.04	.048	3.7	84.8	.....	
9.....	2	730	13.6	8.47	.084	.084	.23	.08	.04	.037	2.9	114.1	.....	Some lime in bath.
10.....	3	730	14.6	8.55	.074	.096	.23	.08	.04	.045	3.7	102.6	.....	Do.
11.....	4	920	15.3	8.55	.075	.075	.24	.08	.05	.034	2.9	114.0	.....	
12.....	2	850	.....	.....	.613	.613	.23	.08	.....	.....	2.86	50.5	1.9	
13.....	4	.....	.....	7.56	.227	.227	.23	.08	.....	.....	2.86	61.4	2.28	
14.....	6	1,050	.....	7.52	.164	.164	.23	.08	.....	.....	2.86	69.4	2.28	
15.....	3	720	14.5	7.52	.....	.033	.....	.....	.....	.....	2.86	79.2	4.3	
16.....	4	720	14.5	7.52	.....	.033	.....	.....	.....	.....	2.86	73.8	4.32	
17.....	5	720	14.5	7.52	.....	.0262	.....	.....	.....	.....	2.86	75.9	4.20	
18.....	5	720	15.5	7.52	.....	.030	.....	.....	.....	.....	2.86	68.6	4.10	Roasted with MnO ₂
19.....	6	720	15.5	7.52	.....	.024	.....	.....	.....	.....	2.86	76.7	4.22	

doubtless due to this cause. The sharp up-turn beyond 850° C. was unexpected and the writers have been unable to explain it. However, as 850° C. is much above the permissible temperature for roasting zinc calcine, this latter part of the iron curve is of little practical importance.

MARMATITE ORE FROM WASA MINE.

Further tests were made with the marmatite ore from the Wasa mine, near Hall, Mont., by roasting and leaching with sulphuric acid. This ore, referred to in previous pages, contained a small amount of "rosin-jack," but the greater proportion of the zinc sulphide was black. The black zinc sulphide appeared homogeneous to the eye, even under the microscope, yet the purest crystal that could be selected contained 55 per cent Zn and 11.5 per cent Fe. Most of the crystals contained more than 16 per cent Fe. An analysis of this ore was as follows: Zinc, 12.9 per cent; iron, 20.72 per cent—insoluble, 38.10 per cent; lime (CaO), 1 per cent; copper, 0.20 per cent; and lead, 0.30 per cent. Another analysis has been given in Table 19 (p. 69).

The excess of iron is present chiefly as pyrite, with a small amount of pyrrhotite. As marmatite is supposed to be a solid solution of iron sulphide in zinc sulphide, the assumption may be made that roasting the zinc sulphide to the oxide without some zinc ferrite being formed along with the iron oxide would be a difficult matter.

The results of a series of roasts and leaches made in the laboratory at the Salt Lake City station by Walter Neal, representing McKeever Bros., under a cooperative agreement with the Bureau of Mines, are given in Table 27. For some reason the analysis of the solution for zinc gave unusually high titrations; hence, the recoveries, as calculated from the weight of zinc in the solutions, are disregarded. The tailing assays show that not more than about 75 per cent of the zinc could be recovered. However, this recovery was higher than was expected from a marmatite ore. On the assumption that the formula of zinc ferrite is ZnFe_2O_4 , every unit of iron is combined with 0.58 unit of zinc. The flotation tests of this ore show that the purest zinc concentrate that could be made by roasting the pyrite to a non-flotative form contained 49 per cent Zn and 20 per cent Fe. Hence there is enough iron in the average marmatite particles to account for 23 per cent of the total zinc in the ore, provided that all of the marmatite iron is converted into ferrite iron by roasting, and that the ferrite of zinc is insoluble in the dilute acid solutions used.

The highest recovery of zinc, under the best conditions of roasting and leaching, was 74.7 per cent, or 25.3 per cent of the total zinc was insoluble. This latter figure compares closely with the 23 per cent calculated as ferrite. Consequently, the writers feel justified in stating that when marmatite ore is roasted, most of the iron present

in the marmatite tends to unite with the zinc to form ferrite of zinc. Fortunately in most blendes such high percentages of "combined" iron are rare. Marmatite, being a solid solution of iron sulphide in zinc sulphide, has variable proportions of iron, but even the purest pieces rarely contain as much as 10 per cent. However, as all "black blendes" will tend to form ferrites of iron during roasting, the advisability of trying to leach such ores is doubtful. The only argument in favor of leaching ores of this type would be that the maximum zinc loss would not, as a rule, be more than about 10 per cent, although it might be higher for an ore, like the Wasa, having an unusually high content of combined iron.

MAGNETIC ROASTING.

By magnetic roasting of zinc ores is meant the process of heating zinc-iron sulphide mixtures to a sufficient degree to partly break up the pyrite into pyrrhotite and elemental sulphur. The lower sulphides of iron are magnetic, and sphalerite is nonmagnetic, hence magnetic roasting puts the ore into such a condition that it is capable of magnetic separation, provided the particles of magnetic iron sulphide and nonmagnetic zinc sulphide are mechanically separable. The data on some laboratory experiments along this line made at the Salt Lake City station are given under "Dry concentration processes" (pp. 45 to 53).

HYDROMETALLURGY OF ZINC SULPHIDE ORES.*

Hydrometallurgical treatment of zinc sulphide ores has been proposed in many different forms during the past half century, but has in general failed to be adopted, on account of the peculiar chemical properties of zinc and the low value of the products that can be made. Zinc requires more chemical or electrical energy, in comparison with its value after recovery, than almost any other major metal on the market; and the high consumption of chemicals or of electric energy involved in its recovery has usually made hydrometallurgical processes of questionable value.

Zinc sulphide resists most ordinary solvents, not being dissolved with sufficient rapidity by any of the commercial acids, hence requires roasting before the majority of the proposed hydrometallurgical processes can be applied. Sulphide of zinc is one of the most refractory sulphides to roast, as is mentioned in the part of this bulletin on roasting (p. 53), and on that account the cost of zinc roasting is higher than that for any other major metal. The lowest reported costs of oxide roasting in zinc smelters are \$1.50 per ton of green ore,

* Experimenters: O. L. Larson, A. E. Gartside, W. J. Woolf, B. W. Johnson, C. E. Sims, M. J. Udy, O. E. Young, A. J. McChrystal, and J. F. Cullen.

and in the older smelters \$4 was not an uncommon cost. Chlorine gas is the only commercial medium that will attack zinc sulphide in the cold, and on this fact are based many of the "chloride" processes later described, their principal value being that the zinc sulphide need not be roasted.

SULPHATE PROCESSES.

In order to get the zinc of the ore into solution as zinc sulphate a number of alternative processes are possible. The ore may be given a sulphating roast, or it may be given an oxidizing roast and then leached with sulphuric acid, or it can be mixed with strong sulphuric acid, without previous roasting, and heated in a reverberatory roaster until SO_2 fumes are evolved. This latter method has been tested in the laboratories at Anaconda and Great Falls, Mont.

A sulphating roast is usually rather difficult of accomplishment and the cost is high. It is reported that C. A. Hansen at Bully Hill, Cal., was able to sulphate as much as 90 per cent of the zinc in the ore from the Bully Hill mine. At Anaconda not more than 50 per cent is sulphated, and with many ores it is not possible to sulphate even 25 per cent of the zinc during roasting. Each ore seems to act differently and the free milling "rosin jack" ores do not sulphate as well as do the "black jack" ores. On the other hand, it is just as hard to roast the sulphide completely to zinc oxide, leaving no zinc sulphate in the ore, even by heating as highly as 1000°C . When a sulphate solution is to be made, the most desirable roast may be that which will either drive off all the sulphur or leave it as zinc sulphate, unless the consumption of sulphuric acid in a process is so large that the maximum sulphating effect is desired more than the formation of the maximum amount of soluble zinc.

Roasting of zinc sulphide ores, followed by leaching with solutions of sulphuric acid, has already been considered (pp. 53 to 79). In general the roasting should be so conducted as to convert all the zinc sulphide to soluble forms, yet the ore must not be heated above 700°C . on account of the tendency for the oxides of iron and of zinc to unite as ferrites of zinc. This makes the roasting a slow process; in spite of all precautions it is impossible with some ores to obtain good recoveries of the zinc by leaching. Thus the leaching plants at Anaconda, Bully Hill, and others have often been unable to get recoveries higher than 60 to 70 per cent. For a time the low recoveries with the sulphuric acid leaching process seemed to threaten its life, but supplementation of the process by igneous concentration of the zinc in the residue, as at Anaconda, seems to give it a better chance of survival.

If the gangue of the ore contains any acid-consuming substances, such as calcium carbonate or calcium oxide, or magnesia compounds

or aluminum compounds soluble in sulphuric acid, the efficiency of the acid for dissolving zinc falls off. As enough acid must be used to supply the requirements of these compounds in addition to that of the zinc minerals, it does not take much of these compounds to make the consumption of acid excessive. Even with 100 per cent efficiency of the acid, 1.5 pounds are required to dissolve one pound of zinc. Therefore, if a zinc sulphide ore does not have a large content of acid-soluble gangue minerals, and roasting will leave no unoxidized blende, insoluble ferrites, basic sulphates, or other compounds, in the calcine, roasting and sulphuric acid leaching to recover the zinc is permissible. If the ore contains any considerable proportion of acid-consuming minerals any hydrometallurgical process of this kind will have to be preceded by mechanical concentration of the ore in order to remove such impurities, together with some of the iron sulphides that are not desirable.

SULPHITE PROCESSES.

A number of processes have been proposed involving the leaching of zinc calcines with a solution of sulphurous acid to form zinc bisulphite, which is sufficiently soluble in water to make such a method a commercial possibility. The original methods involved precipitation of the zinc as monosulphite of zinc, which is insoluble, by warming the solution of bisulphite. In heating the solution some sulphur dioxide would be liberated, and this could be caught and used again with that obtained from thermal decomposition of the zinc monosulphite in a furnace heated to a sufficiently high temperature.

DIFFICULTIES OF APPLYING PROCESS.

In practice some difficulties in the application of this process were met. In roasting zinc sulphide ores it is possible to obtain roaster gases containing about 5 per cent SO_2 . The strength of the solution that can be prepared from this gas varies from 0.5 to 1.5 per cent SO_2 . On the assumption that the solution will average 1 per cent SO_2 and that the ore to be treated contains 30 per cent zinc, 60 tons of this 1 per cent solution will be required to leach the zinc completely from 1 ton of ore. This solution ratio is too large for economical work in any hydrometallurgical process. Consequently the roaster gas would have to be applied directly to a pulp of the ore, rather than being dissolved by water in an absorption tower. Pulp can not be treated in a tower as it would soon choke the openings, hence some type of mechanical agitator for applying the gas to the pulp would be necessary. As far as the authors can learn, no such machine has ever been tried. The solubility of zinc bisulphite is such that about 6 per cent zinc can be easily obtained in

solution, hence a 30 per cent ore would require 5 tons of solution per ton of ore, a volume which is very easily handled in the machines now available. Possibly an apparatus comprising a rotating drum, in which the gases and the pulp would pass in countercurrent, would be acceptable for this work, the zinc oxide of the ore combining with the dissolved sulphur dioxide fairly rapidly, so that more sulphur dioxide could dissolve in the water until all the zinc oxide had been converted to monosulphite of zinc, after which the addition of sulphur dioxide would form bisulphite of zinc until all the zinc had gone into solution.

In order to design such a machine properly, the rate of reaction of sulphur dioxide solutions of various strengths on roasted zinc sulphide ore, and the rate of absorption of sulphur dioxide gas by water in a tumbling barrel of this type would have to be determined. It is known that the rate of absorption of gases in liquids, when the liquids are showered down through the gases, is extremely rapid and depends on the effectiveness with which the water is sprayed. Nothing was known as to the rate of reaction between the sulphurous acid solutions and the ordinary zinc oxide calcine.

EXPERIMENTS.

Therefore, a series of tests were made on such a calcine with different strengths of sulphur dioxide solution for different time intervals, in order to obtain an idea of the reaction velocity. A sample of the zinc sulphide concentrate from the Daly-Judge concentrating mill, at Park City, Utah, was roasted and the calcine was treated with measured quantities of sulphurous acid solutions of known strength. Treatment was in 2.5-liter bottles placed on their sides on a rolling agitator to give much the same motion as that given to pulp in a tube mill or similar rotating barrel arrangement. The sample analyzed 46.6 per cent Zn, 7.4 per cent Fe, 1.86 per cent Pb, 1.54 per cent Cu, and 30.44 per cent S. The calcine contained 49.6 per cent Zn. The screen analysis of the calcine was as follows:

<i>Screen analysis of calcine.</i>		<i>Per cent.</i>
On 20 mesh.....		0.05
On 35 mesh.....		17.0
On 65 mesh.....		47.05
On 100 mesh.....		17.80
On 150 mesh.....		6.85
On 200 mesh.....		6.05
Through 200 mesh.....		5.25

In the calcine 10.8 per cent of the zinc was present as zinc sulphate. The results of the tests are plotted in figure 9. In each test the theoretical amount of sulphur dioxide needed to render all the zinc soluble was used. Consequently, as 10.8 per cent of the zinc was

present in the calcine as sulphate, about 10 per cent excess SO_2 over that necessary to leach the remainder of the zinc was present. From the curves it can be seen that even with 0.2 per cent solutions of SO_2 , all the soluble zinc was dissolved in about 30 minutes. Only 96 per cent of the total zinc was soluble, the other 4 per cent presumably being present as unaltered sulphide or as ferrite. In a

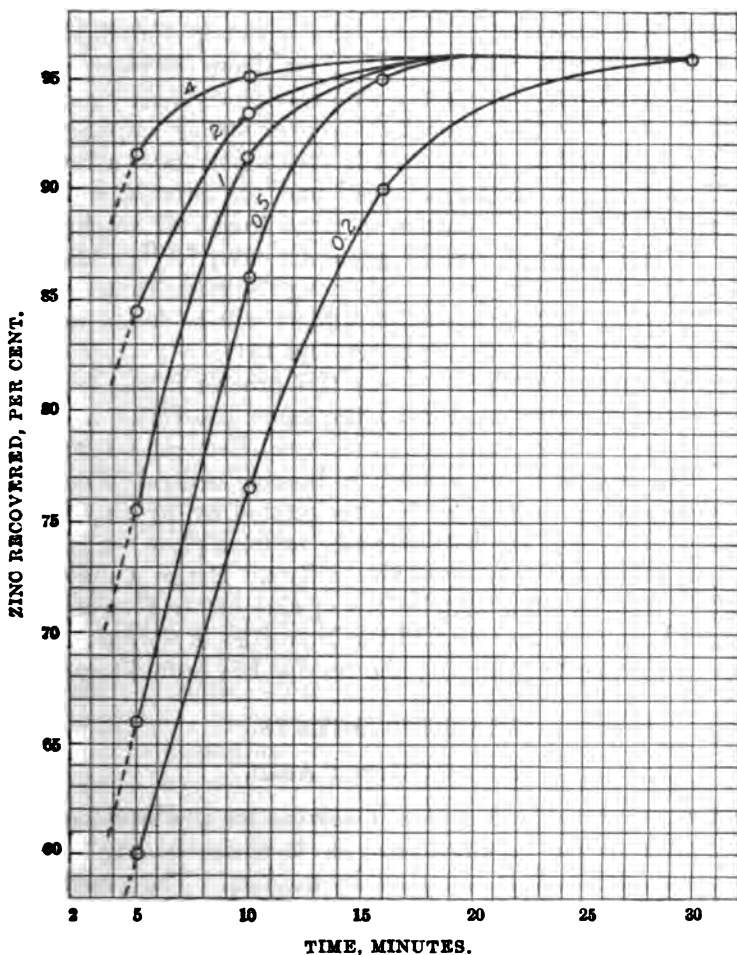


FIGURE 2.—Curves showing effect of strength of sulphurous acid on velocity of solution of zinc oxide. Figures near each curve indicates percentage of SO_2 in solution used.

rotating barrel, with continuous feed and discharge through the trunnions, and countercurrent application of the roaster gases, the tendency would be for the strongest solution of sulphur dioxide to form at the point where the pulp is discharged, the pulp traversing the barrel in solution of gradually increasing strength. With a 1 per cent solution, 91.5 per cent of the zinc is dissolved in 10 minutes

and all of the soluble zinc in 15 minutes. Hence it is probable that the pulp would not need to remain in the tumbling barrel more than 15 or 20 minutes, provided that enough roaster gas could be introduced into the barrel in that time.

These figures are sufficiently encouraging to warrant the testing of such a solution barrel on a semicommercial scale by those who are interested in the possibility of this method.

As is shown in a subsequent part of this report (p. 100) dealing with precipitation of solutions, recovery of the zinc from the bisulphite solution by boiling is difficult because zinc bisulphite readily oxidizes to zinc sulphate. If it is expected to recover strong sulphur dioxide vapor from this boiling, to be used in making stronger solutions for leaching, trouble will be experienced and the process will not be satisfactory. If the ore contains a large excess of sulphur to be roasted off and only the roaster gases are used for leaching, there should be no difficulty in providing enough sulphur to carry on the work. A further discussion of this subject will be found under the leaching of oxidized zinc ores (pp. 130 and 131).

In testing several sulphide ores by this process it was found that solutions of sulphurous acid gave the same recoveries as did the sulphuric-acid solutions, and that the same chemical reactions took place. If the solutions are allowed to become neutral in order that iron and other impurities may be precipitated by hydrolysis in the presence of limestone, the insoluble zinc monosulphite tends to form so that the ultimate recovery of zinc suffers. Hence it may be said that purification of sulphite solutions of zinc before filtering, is still an unsolved problem, and that all the impurities in the solution must be allowed to remain until after the residue has been filtered off.

LEACHING AGENTS.

HYDROCHLORIC ACID.

The use of hydrochloric acid as a solvent for the leaching of zinc sulphide ores might be considered in localities having industrial plants where the acid is a useless by-product. The possibility of making Le Blanc soda at Great Salt Lake might be considered if hydrochloric acid could be used for that purpose. The advantage of using Le Blanc soda would be in the preparation of a solution of zinc chloride from which zinc hydrate could be precipitated by the use of lime, thus permitting the preparation of a zinc-oxide product suitable for some purposes, by utilizing only cheap chemicals. The use of hydrochloric acid on zinc carbonate ores was tested at the Salt Lake City station with some success. (See section on "Oxidized Ores," pp. 121 to 129.) Chloridizing roasting with salt, followed by water leaching, failed to give satisfactory recovery of the zinc.

HYDRO-FLUOSILICIC ACID.

Hydro-fluosilicic acid was recommended as being a desirable solvent for roasted zinc ores, on account of the ease of precipitating zinc from such solutions by electrolytic methods. However, this acid proved to be no better solvent of the zinc oxide, resulting from roasting the zinc sulphide, than was sulphuric acid or sulphurous acid, and its use had no particular advantage, as far as leaching is concerned. Hence, experiments with this reagent were discontinued. Reference to the tests with carbonate ores of zinc (p. 131) will reveal a good reason for not carrying this work any farther; also, the cost of preparing the acid is another good argument against its use, because large amounts are consumed by gangue minerals in the ores. The acid is used in lead refineries, but the losses in such work are much smaller than those which would be encountered in leaching roasted zinc ores.

CAUSTIC SODA.

Caustic soda has been proposed as a solvent for zinc oxide in many different processes. In these, soluble zincates of sodium are formed, and the recovery of the zinc is usually by electrolysis. Caustic soda solutions might be used in the presence of large amounts of acid-consuming gangue, thus avoiding acid losses, but the solutions used must be so strong (20 to 30 per cent NaOH) that serious losses of caustic soda in the tailing will result unless the tailing is carefully washed and the dilute wash solution evaporated. As evaporation is a relatively expensive process, this procedure would not be advisable. Moreover, the zinc sulphate always formed in roasting will tend to form sodium sulphate, using up further caustic soda, and any other sulphates present, such as iron or aluminum sulphates will cause still further consumption of the solutions. The sodium sulphate would have to be removed periodically and for this purpose lime is not efficient. Barium hydrate would be a good reagent for this purpose but would be liable to prove too expensive.

AMMONIACAL SOLUTIONS.

Ammoniacal solutions for leaching roasted zinc sulphide ores offer a more promising method. Mixtures of ammonia and ammonium carbonate are advocated by Bretherton,^a whose papers have been before the public for some years past. Such solutions dissolve zinc oxide, zinc sulphate, and zinc carbonate, but do not attack zinc sulphide, zinc ferrite, or zinc silicate. Consequently, in the treatment of roasted sulphide ores, only the same compounds as those dissolved by sulphuric acid are soluble in these solutions.

^a Bretherton, S. E., The treatment of complex ores by the ammonia-carbon dioxide process: Trans. Am. Inst. Min. Eng., vol. 49, August, 1914, p. 802.

As far as can be learned, the leaching seems to offer no difficulty, the principal problem being the precipitation of the zinc from solution and the recovery of the ammonia. To date the proper adaptation of ammonia-handling machinery to this work has not taken place.

LEACHING IRON FROM ZINC-IRON SULPHIDES.

On account of the difficulty of roasting zinc sulphide completely, the testing of a proposed process for separating mixtures of zinc and iron sulphides by removing the iron, in place of leaching the zinc, was deemed worth while. On heating pyrite in a reducing atmosphere pyrrhotite or iron matte is formed, depending on the temperature, and both of these react quickly with sulphuric acid, forming ferrous sulphate and hydrogen sulphide. Pyrrhotite is about 25 times as easily dissolved as sphalerite and 75 times more easily than pyrite. Hence, the proposed process involves heating a mixture of zinc and iron sulphides, which is a common type of complex sulphide ores, in a reducing atmosphere in order to render the iron sulphide minerals easily soluble in sulphuric acid. Such a process would be useful at smelters needing an outlet for the disposal of sulphuric acid and sulphur. The pyrite loses its "feeble atom" of sulphur during such treatment, the sulphur condensing from the reducing gas after cooling. The hydrogen sulphide from the reaction of sulphuric acid on the calcine can be easily absorbed by lime, making calcium sulphide, a valuable product, or any similar sulphide can be made. Possibly a market could also be found for the iron sulphate formed.

The conditions requisite for this process were determined with a combustion tube. It was found that temperatures between 600° and 950° C. were the most satisfactory; at temperatures outside of this range the recoveries of iron were lower. Coal gas from the city mains, carbon monoxide gas, and hydrogen sulphide gas were all found to be suitable reducing atmospheres. With carbon monoxide and coal gas, some of the sulphur distilled from the pyrite gave an ill-smelling compound, COS, occasionally masked by the smell of other organic compounds of sulphur. The presence of both steam and air was found to be fatal to the process, for these seemingly oxidized the iron to such a condition that it was superficially resistant to the dilute sulphuric acid. However, by preliminary heating in air, most of the "feeble atom" of sulphur could be removed; then a short subsequent treatment in a dry reducing atmosphere would convert the residue to a condition such that it would react with the dilute acid.

DESCRIPTION AND RESULTS OF TESTS.

A sample of the ore from the Greenwood mine, at Pioche, Nev., which is so intimately crystallized that no method of mechanical separation has proved of much benefit, was tested by this process. The average results were as follows:

Results of test of ore from Greenwood mine:

	Original.	Residue.	Recovered in solution.
Zinc (Zn).....Per cent..	21.35	24.91	11.0
Iron (Fe).....do.....	16.13	3.38	84.1
Lead (Pb).....do.....	9.54	12.12	4.5(?)

The original ore contained too little combined zinc and lead to be shipped profitably to a pigment plant making leaded zinc oxide, but the residue contained enough to be acceptable.

Middling from the wet-concentrating mill at the Midvale smelter of the United States Smelting Co. was likewise tested with favorable results:

Results of test of ore from Midvale smelter.

	Original.	Residue.	Recovered in solution.
Zinc.....per cent..	28.25	41.1	2.6
Iron.....do.....	24.87	10.7	71.2

Middling from the Mary Murphy mine in Colorado, the Big Four mill near Park City, Utah, and similar materials gave like results.

In all the ores containing only mixtures of pyrite and sphalerite no difficulty was met in removing the iron. However, in ores containing "black jack" or marmetite, the iron is known to be in solid solution in the zinc sulphide, and hence is not attacked by the dilute sulphuric acid. Examples of the average figures on two such materials follows, the first being middling from the Comet mine at Basin, Mont., and the other being ore from the Cleveland mine at Silver City, N. Mex.

Results of tests of materials from Comet mill and Cleveland mine.

	Original.	Residue.	Recovered in solution.
Middling from Comet mill:			
Zinc.....per cent..	21.1	25.0	13.9
Iron.....do.....	25.12	18.9	54.7
Lead.....do.....	7.72	9.5	.....
Ore from Cleveland mine:			
Zinc.....per cent..	23.5	43.5	23.1
Iron.....do.....	30.2	16.6	77.15

Usually zinc ore-buying contracts are so worded that some of the original materials mentioned can not be sold to any advantage by the average shipper in the intermountain region. Some of the products of this process, however, are well within the range of profitable work, and in spite of their loss in weight from loss of sulphur and iron,

are worth more, in actual gross value, than the original material. With spelter at 5 cents per pound and the usual contracts, the increase in value of the material plus the saving from decreased cost of freight to the smelter of a zinc-iron sulphide mixture containing about 30 per cent Zn, amounts to between \$10 and \$14 per ton of original material.

The only important difficulty with the process is that it requires a dry reducing atmosphere at a temperature of 600° to 900° C., conditions which are difficult of technical attainment. Probably dry carbon monoxide gas could be provided at a reasonable figure by using dry coke in a gas producer, but to design a retort or similar furnace for utilizing this gas would be difficult. Any chance oxidation due to flue gases or to water vapor from combustion gases must be avoided. Probably after cooling and condensing the sulphur from the reducing gases issuing from the furnaces, the gases could be either used again or burned under the furnaces. On account of the difficulty in designing a satisfactory furnace of simple design that would meet all the conditions, the writers have temporarily abandoned further investigation of this process.

PRECIPITATION OF ZINC SOLUTIONS.*

The successful precipitation of solutions containing zinc is the main factor on which hinges the commercial possibility of any hydrometallurgical process for zinc ores. Such great purity is required of any zinc compounds usually marketed that chemical precipitation of such a product as zinc oxide, in a form commercially acceptable, is a difficult matter. Also, when electrolytic precipitation is to be employed, minute amounts of impurities are often fatal to good deposition.

ELECTROLYTIC DEPOSITION.

A separate report on electrolytic zinc is being prepared by the Bureau of Mines, and that phase of the subject will not be taken up in this bulletin.

CHEMICAL PRECIPITATION.

With some of the more unusual solvents that have been proposed, chemical precipitation of zinc oxide or similar marketable products from the solutions has been sought.

AMMONIACAL SOLUTIONS.

Precipitation of ammoniacal solutions of zinc by boiling drives off most of the ammonia and leaves a precipitate of zinc hydrate which can be calcined to zinc oxide. The process permits the preparation

* Experimenters: O. E. Young, C. W. Frith, H. J. Morgan, and R. G. Hinman.

of reasonably pure zinc oxide, because so few impurities of the zinc ore are soluble in ammonia. Copper compounds can be precipitated from these solutions before boiling, by the use of metallic zinc. As hinted at in the discussion of leaching (p. 86), the chief difficulties are due to deterioration of the solution and to losses of ammonia in the tailing and by vaporization. Machinery capable of leaching ores in confined tanks, and of absorbing all the ammonia evaporated from the solutions at any part of such a plant would have to be invented. Further, the cost of heating and boiling solutions to recover ammonia is somewhat higher than any of the unit costs usually allowed in plants treating ores of this kind. Ammonia sulphates and chlorides and other compounds formed in the leaching of the ore would have to be decomposed, in order to liberate the ammonia from the solution, by the use of lime after the zinc had been precipitated, and this would add a complication. The method deserves further study, but at the present time it is probable that methods can be developed which will not call for such complicated plants.

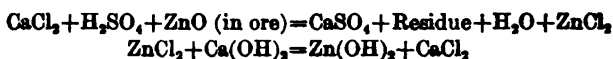
CAUSTIC ALKALI SOLUTIONS.

Caustic alkali solutions of zinc (sodium zincate) can be decomposed by dilution, zinc oxide being precipitated, but evaporation of the solution after precipitation, in order to obtain a strong solution of caustic for further work, is rather expensive. Such solutions can also be electrolyzed, but usually give a spongy deposit, and the market for zinc dust is limited. Consequently there seems to be nothing to favor processes involving the use of caustic alkali solutions.

SULPHATE SOLUTIONS.

Sulphate solutions of zinc might be precipitated by such reagents as ammonia or caustic soda, giving a hydrate of zinc and a sulphate of the ammonia or the alkali metal which could be recovered or discarded. As regards ammonia, the solution of ammonium sulphate would later have to be boiled with lime added, in order to recover the ammonia for reuse. Many of the same objections that apply to the direct leaching of ore with ammonia solutions also apply to this latter process. Furthermore, the amount of ammonia absorbed in the precipitate would be very liable to make the losses of ammonia too high. Caustic soda, as a precipitant, is too expensive. Even crude sodium carbonate can not be delivered to many points in the intermountain region or elsewhere for less than 1 cent per pound. Beside, the sulphuric acid used in leaching the ore is not regenerated as in electrolytic precipitation. This is not a serious drawback as sulphuric acid can be made very cheaply as soon as a market for it is assured.

If lime could be used as a precipitant it would be much cheaper than either ammoniacal or alkaline precipitants; also most precipitates of metal hydrates made with lime are well flocculated and easy to filter. On that account rather thorough tests were made of a method of using lime as a precipitant of zinc sulphate solutions, which involved converting the zinc sulphate solution to zinc chloride solution by the use of a solution of calcium chloride, followed by precipitation of the zinc as zinc hydrate by the use of lime. The proposed method involved running a solution of calcium chloride onto the ore, adding sulphuric acid to bring the zinc into solution, leaving calcium sulphate in the ore and yielding a solution of zinc chloride containing the excess of calcium chloride. In precipitation of this solution with lime the calcium chloride would be regenerated. The reactions involved are:



This process utilizes two very cheap chemicals, sulphuric acid and lime. Enough calcium chloride would have to be added to make up for mechanical losses of that chemical. Consequently, investigation of the two reactions outlined above was necessary.

PRECIPITATION OF ZINC SULPHATE SOLUTIONS WITH CALCIUM CHLORIDE.

The first step was to see whether zinc sulphate solutions could be converted to chloride of zinc by the use of calcium chloride. To do this, a series of fractional precipitations of the sulphates were made by adding to known amounts of zinc sulphate solutions 0.5, 0.6, 0.7, 0.8, 0.9, 1, and 1.1 equivalents of calcium chloride. The results are contained in Table 28. In each test the calcium chloride solution acted on the zinc sulphate solution for about 60 minutes before filtration. No filtration difficulties in the handling of the calcium sulphate precipitate were experienced. The solution of zinc used contained 4.24 grams of zinc per 100 c. c.

TABLE 28.—*Precipitation of sulphates from zinc sulphate solutions with calcium chloride.*

CaCl ₂ equivalent.	Zinc content of precipitate.	Zinc lost.	SO ₄ precipitated.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
0.5	0.56	1.18	50.2
.6	.51	1.13	58.8
.7	.15	.41	65.7
.8	.05	.18	74.6
.9	.05	.18	81.7
1.0	Nil	Nil	87.3
1.1	Nil	Nil	93.0

From these tests it can be seen that while an 0.5 equivalent of calcium chloride will precipitate the calculated amount of calcium

sulphate from a zinc sulphate solution containing 5 per cent Zn, the theoretical equivalent to all the sulphates will precipitate only 87 per cent of the sulphates. The remaining 13 per cent of the sulphates is probably dissolved calcium sulphate. There is no published figure on the solubility of calcium sulphate in zinc chloride solutions, but the solubility of CaSO_4 in hydrochloric acid solution of 6 per cent strength is 6.12 parts per 100 parts of water, whereas the solutions used contained 2.36 parts at 25°C . As the solutions contained nearly 5 per cent Zn, or more than 10 per cent ZnCl_2 , the conclusion drawn is probably justified. One encouraging feature was that the precipitated calcium sulphate contained almost no zinc. When the theoretical or slightly more than the theoretical amount of calcium chloride was used no zinc was adsorbed in the precipitate and lost.

PRECIPITATION OF ZINC CHLORIDE SOLUTION WITH LIME.

As the tests had shown that fairly efficient precipitation of the sulphates from solution could be obtained by use of calcium chloride, tests on the precipitation of zinc chloride solutions with lime were next in order.

TESTS WITH PURE ZINC CHLORIDE.

At first pure zinc chloride solutions were prepared, in order that the analysis of the precipitate might be studied without having any complicating effect due to the presence of dissolved calcium sulphate. Two solutions of zinc chloride were prepared, one containing 10 per cent Zn and one 5 per cent. Each of these solutions was tested with a series of additions of lime in amounts varying from 0.5 to 1.0 equivalent to the zinc. The mixtures were allowed to stand for 24 hours to insure complete reaction. The lime used contained 47.4 per cent CaO and 29.9 per cent MgO . The data on these tests is given in Table 29.

TABLE 29.—*Precipitation of zinc chloride solutions with lime.*

Zinc content of solution.	CaO equivalent.	Precipitation.	Content in air-dry precipitate.		
			Zinc.	CaO.	MgO.
<i>Per cent.</i>		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
5	0.5	51.0	57.7	1.50	2.03
5	.6	61.8	53.8	1.98	2.39
5	.7	71.6	53.6	1.95	2.22
5	.8	83.2	53.7	2.18	2.06
5	.9	92.3	51.5	2.76	3.51
5	1.0	99.5	51.6	3.06	4.30
10	.5	57.0	49.8	2.62	2.26
10	.6	66.8	49.8	3.18	3.84
10	.7	75.1	52.8	2.38	2.51
10	.8	85.8	46.0	4.47	4.03
10	.9	93.7	41.6	5.42	4.42
10	1.0	98.8	43.4	5.31	4.82

The conclusions drawn from these tests were as follows:

1. The magnesian lime used precipitated the zinc in slightly more than the calculated proportion, especially with 10 per cent Zn solutions.

2. The excess of zinc precipitated beyond the theoretical proportion is doubtless a basic salt, as an excess of zinc oxide is known to form such basic compounds with zinc chloride solutions.

3. The purest precipitate was obtained with half of the theoretical amount of lime necessary, and as the theoretical amount was more nearly approached, the precipitate contained more and more lime and magnesia which had not reacted with the zinc chloride solution to form calcium or magnesium chlorides.

4. The precipitates prepared from 10 per cent Zn solutions were rather difficult to filter, but the precipitates from the 5 per cent Zn solutions were easily filtered. On drying the precipitates and preparing them for analysis, those from the 10 per cent Zn solutions were also sticky and difficult to pulverize.

5. It is possible to precipitate all the zinc from a zinc chloride solution without using an excess of lime.

6. Fine grinding of the lime, or the preparation of a lime paste by slaking, before addition to the zinc solutions, gives more complete reaction; also less washing of the precipitate is necessary to remove calcium chloride. A lime paste was found to be the best and most reliable form in which to add the precipitant.

EXPERIMENT WITH OXIDIZED ZINC ORE.

Although the grade of precipitate obtained in the test with zinc chloride was not satisfactory, on account of the large amount of lime and magnesium compounds left in the precipitate, an attempt was made to precipitate the solution obtained by treating oxidized zinc ore from the Wolftone mine of the Western Mining Co., of Leadville, Colo. The ore was mixed with strong sulphuric acid and calcined at 600° C. in order to break up colloidal silicic acid, iron sulphates, and other compounds. The ore was then leached with water and the resulting zinc sulphate solution was used for a series of precipitation tests. The usual procedure would involve leaching the calcine with calcium chloride solution, followed by purification of the solution with crushed limestone before filtering from the residue, but these steps were conducted separately in order that the precipitates of calcium sulphate, etc., might be examined separately. On that account calcium chloride solution was added to the water solution of zinc sulphate (containing small amounts of other metal sulphates), and the resulting precipitate of calcium sulphate was filtered from the solution. After filtration, ground lime rock was agitated with the solution for about one hour for the purpose of

removing iron and aluminum from the zinc chloride solution by hydrolysis. Then this precipitate was filtered and the purified zinc chloride solution was treated with the theoretical proportion of a paste of freshly slaked lime to precipitate zinc hydroxide and regenerate the calcium chloride solution. The zinc hydroxide precipitate was then filtered and dried. In normal operation the reaction of the calcium chloride on zinc sulphate would take place in the presence of the ore, and likewise the purification with lime rock.

The results of this test are contained in Table 30.

TABLE 30.—*Results of treating zinc-sulphate leaching solutions with lime compounds.*

[500 c. c. of solution used in each test.]

CaSO ₄ precipitate.		CaCO ₃ purification.			Zn (OH) ₂ precipitate.									
Weight.	Zn.	Weight.	Zn.	Fe.	Weight.	Zn.	Mn.	Fe.	CaO.	MgO.	Cl.	Time.	Percentage of recovery.	
Grams.	P. ct.	Grams.	P. ct.	P. ct.	Grams.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	Hr. Min.		
35.....	0.94	14.0	0.94	0.89	21.5	23.3	0.05	0.23	37.4	1.5	6.75	5	44.6	
28.....	.26	14.0	1.28	1.71	18.0	26.4	Trace.	.47	35.0	2.4	3.90	10	42.3	
37.....	.94	19.0	.94	1.06	19.5	25.0	0.10	.23	35.2	1.5	4.08	20	43.4	
41.....	.60	11.5	.77	1.01	22.2	30.8	Nil.	.33	28.4	1.0	5.96	40	60.9	
36.....	.77	16.5	.69	.91	22.0	34.1	Nil.	.48	26.9	1.3	8.66	1	66.7	
41.....	.77	15.0	.60	.92	22.5	40.0	Trace.	.47	22.4	0.5	7.81	2	80.2	
35.....	.77	14.5	.86	1.31	28.5	41.0	2.18	.70	13.5	5.7	6.66	4	85.5	
43.....	.60	13.5	.94	1.30	20.3	51.7	2.16	.42	6.6	3.5	6.04	8	93.4	

From these results the following conclusions can be drawn:

1. The reaction of the lime paste on the zinc chloride solution requires more than one hour before it is approaching commercially satisfactory completion. Four or eight hours' time is better, and the indications are that 24 hours would be still better.

2. The lime content of the zinc hydroxide precipitates is high unless the time of reaction is more than four hours. It is probable that the coating of zinc hydroxide over lumps of calcium hydroxide slows down the reaction of zinc chloride on the lime, making necessary long agitation in order to obtain a complete double decomposition.

3. The preparation of a lime paste of sufficient strength that 1 c. c. is equivalent to 0.2 gram of zinc was found to be easily attainable.

4. The chlorine content of the air-dried precipitate of zinc hydroxide was variable but seemed to tend toward an average of 6 per cent. This chlorine is probably present as basic chloride of zinc. When the hydrate of zinc is ignited to form zinc oxide most of the chloride of zinc would be volatilized and would have to be caught again in water for reprecipitation.

5. The ore that was treated in this series of tests contained manganese, which was precipitated with the zinc, discoloring the zinc

hydroxide to a dirty brown color when the reaction was nearly completed. Manganese sulphate is not hydrolized in the presence of crushed lime rock in cold solutions and hence is not completely removed with the iron and the alumina.

6. The precipitate of calcium sulphate formed in the first reaction of the process carries very little zinc and can be discarded. Not more than 1 per cent of the total zinc is lost in this way.

REMOVAL OF MANGANESE.

USE OF CHLORIDE OF LIME IN MODERATE AMOUNTS.

On account of the discoloration of the zinc hydroxide precipitate with manganous hydroxide and its oxidation products, further tests were necessary in which removal of the manganese by oxidizing it with some form of chlorine was sought. In the first set of tests made, chloride of lime was used to supply the chlorine. Twenty pounds of CaOCl_2 , per ton of solution were used in each test, and a series of tests were made in which various amounts of sulphuric acid were added to liberate more or less of the chlorine from the chloride of lime. These amounts of sulphuric acid are recorded in the columns of "acid equivalents." The calcium chloride and chloride of lime were added together, forming the first precipitate, which was removed by filtration, then crushed-lime rock was added to remove iron and alumina, followed by precipitation of the zinc with a paste of slaked lime. The results are contained in Table 31.

TABLE 31.—*Results of treating zinc sulphate solutions with lime compounds for removal of manganese.*

[In each test: 20 pounds of CaOCl_2 , per ton of solution; 500 c. c. of solution; 30.50 grams Zn per liter; time, 4 hours.]

Acid equiv- alent.	CaSO ₄ precipi- tate.		CaCO ₃ precipitate.				Zn (OH) ₂ precipitate.							Per- centage of re- covery.
	Weight.	Zn.	Weight.	Zn.	Fe.	Mn.	Weight.	Zn.	Mn.	Fe.	CaO.	Cl.		
	<i>Grams.</i>	<i>P. ct.</i>	<i>Grams.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>Grams.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>		
0.0	28.6	Trace.	14.7	4.86	3.85	0.16	32.5	38.1	0.07	0.09	21.85	11.83	81.2	
.125	46.4	Trace.	22.0	2.50	2.27	.08	30.1	37.1	.04	.22	20.90	9.24	73.3	
.25	39.2	Trace.	20.3	2.10	2.68	.14	32.2	36.5	.04	.17	19.75	9.58	77.6	
.5	50.3	Trace.	27.5	1.18	1.87	.15	32.5	36.5	.035	.31	20.85	8.51	77.8	
1.0	39.0	Trace.	26.3	1.18	1.89	.53	37.8	33.6	.035	.13	20.60	9.66	80.7	
1.5	49.9	Trace.	28.3	1.18	1.74	.91	34.1	39.2	.021	.13	19.90	11.78	87.5	
2.0	42.0	Trace.	27.0	0.79	1.18	.74	33.9	37.8	.028	.17	19.05	10.25	83.9	

The table shows that the manganese content of the final precipitate was low; also it was observed that the precipitate was of a satisfactory white color. The lime content of the precipitate was too high, as insufficient time had been allowed for the reaction of the lime on the zinc chloride solution. On that account further treat-

ment of these precipitates with zinc chloride solutions, to see whether the lime would react and go into solution as calcium chloride, was thought best. This was done with the precipitates from the next set of tests about to be described.

USE OF LARGER AMOUNTS OF CHLORIDE OF LIME.

As the improved color of the precipitate was encouraging, another series of tests was made with greater amounts of chloride of lime, in the hope that most of the manganese could be precipitated as the dioxide, in a marketable product. The results of the tests are reported in Table 32. The use of the greater amounts of chloride of lime seemed to give erratic results, and the precipitates were colored with manganese, especially those in the first and third tests, which were very brown. However, the lower percentage of lime left in the precipitates, as compared with the previous set of tests, was a favorable feature.

TABLE 32.—Results of treating zinc sulphate solutions with excess CaOCl_2 to remove manganese.

[300 c. c. of solution, with 3.05 per cent Zn content, used in each test; solution agitated 4 hours at 20° C.]

CaOCl ₂ , pounds per ton.	CaSO ₄ -CaCO ₃ precipitate.				Zn (OH) ₂ precipitate.							
	Weight.	Zn.	Fe.	Mn.	Weight.	Zn.	Fe.	Mn.	CaO.	MgO.	Cl.	Per-centage of re-covery.
	<i>Grams.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>Grams.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	
40	79.2	3.15	2.72	0.75	27.5	45.7	0.91	2.47	13.10	3.85	4.58	82.6
60	101.2	1.05	6.85	.75	26.2	49.7	1.72	.40	9.55	4.47	2.91	85.0
80	93.0	2.63	3.56	.76	27.9	47.2	.18	2.21	15.05	3.96	3.54	86.5

USE OF ZINC CHLORIDE SOLUTION.

The content of lime left in the precipitates was still too large, so the precipitates of this last series of tests were further treated with a 5 per cent ZnCl_2 solution, to correspond with the conditions for precipitation of zinc chloride solutions with lime in a series of counter-current agitators and thickeners. The data on these tests are contained in Table 33. Test 4 was made with a mixture of precipitates, from one of the former sets of tests, having a high lime content.

TABLE 33.—Results of treating zinc hydroxide precipitate with zinc chloride solution to remove lime.

Test No.	Original precipitate.						Final precipitate.					
	Weight.	Zn.	CaO.	MgO.	Cl.	Mn.	Weight.	Zn.	CaO.	MgO.	Cl.	Mn.
	<i>Grams.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>Grams.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
1.....	18.0	45.7	13.10	3.86	4.58	2.47	21.7	54.2	1.29	2.72	8.18	0.13
2.....	19.1	49.7	9.55	4.47	2.91	.40	26.5	53.1	1.10	2.42	9.00	.39
3.....	17.0	47.2	15.05	3.96	3.51	2.21	20.8	54.7	1.90	2.50	6.05	.73
4.....	100.0	34.9	19.52	.....	.....	.....	120.7	49.4	3.40	.40	8.25	.08

This series of tests shows that 4 hours' agitation of the precipitate with fresh zinc chloride solution removes practically all of the lime, leaving less than 2 per cent CaO in the precipitate, although not much of the magnesia was removed. The percentage of zinc was not raised much and the percentage of chlorine was increased. It was noticed that the precipitates tended to combine with the zinc chloride of the solution to form hard cakes, supposedly oxychloride of zinc, which will set somewhat like magnesium oxychloride cement. When the zinc hydroxide is later calcined to form zinc oxide, all of the zinc chloride would be volatilized and could be caught from the calciner gases and returned to the zinc chloride solutions. For some reason the manganese content of the residual zinc hydroxide was lowered markedly, although the precipitate still had a dark color.

TESTS WITH CHLORINE WATER.

As no advantage was to be gained from using large amounts of chloride of lime for preventing manganese from entering the precipitate, it was next determined to try chlorine gas for the oxidation of the manganese, as well as to try the effect of heating the solution while using chloride of lime. The conditions of the five tests made were as follows:

No. 1. Hot, CaOCl_2 , 20 pounds per ton of solution.

No. 2. 200 c. c. of saturated chlorine water per 500 c. c. of solution, cold.

No. 3. 400 c. c. of saturated chlorine water per 500 c. c. of solution, cold.

No. 4. 200 c. c. of saturated chlorine water per 500 c. c. of solution, boiling.

No. 5. 400 c. c. of saturated chlorine water per 500 c. c. of solution, boiling.

The data on the precipitates obtained in these tests is contained in Table 34. The chlorine was applied to the solution at the same time as the lime rock, as this provides the conditions under which manganese should theoretically be precipitated. Actually very little manganese was eliminated from the solution; later it was thought that the manganese must be present in the oxidized solutions as manganates or permanganates of zinc or calcium, all of which are very soluble. In these tests insufficient lime for complete precipitation was used, as it was hoped that with the smaller amounts of lime zinc hydrate of reasonable purity could be obtained in four hours' reaction. The results indicate that the precipitate can not be kept free of lime unless the lime and the zinc chloride solution are in contact at least eight hours or more. The precipitates obtained in this series of tests were white and contained sufficiently low percentages of

iron and manganese to be acceptable. Only the lime and chlorine are left, according to the analyses recorded. Later it was found that sulphates also were present in serious amounts.

TABLE 34.—*Results of treating zinc sulphate solutions with chlorine to oxidize manganese.*

[500 c. c. of 3.05 per cent Zn solution in each test.]

Test No.	CaSO ₄ precipitate.			CaCO ₃ precipitate.			Zn (OH) ₂ precipitate.							
	Weight.	Zn.		Zn.	Mn.	Fe.	Weight.	Zn.	Fe.	Mn.	CaO.	MgO.	Cl.	Per-centage of re-covery.
		Per-cent-aga.	Weight.											
	Grams.		Grams.	P. ct.	P. ct.	P. ct.	Grams.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	
1.....	41.8	0.43	30.5	3.94	Nil.	1.81	12.7	51.7	0.36	0.06	7.6	0.38	6.12	45.0
2.....	42.5	.26	15.2	2.23	2.40	3.30	15.4	46.8	.44	.05	7.3	.25	5.17	43.5
3.....	44.2	.26	19.7	3.67	6.30	2.72	15.2	48.6	.43	.13	8.7	.28	6.81	47.2
4.....	43.5	.87	28.5	3.02	1.20	2.17	13.8	46.0	.45	.24	10.8	.52	6.05	48.6
5.....	45.5	1.22	29.6	11.55	.68	1.85	13.9	49.0	.36	.09	8.3	.38	5.17	41.5

The chlorine used in these tests had been applied as chlorine water, which diluted the zinc chloride solution. In the next series of tests chlorine gas was applied directly to cold solutions.

TESTS WITH CHLORINE GAS.

The designing of this set of tests depended on the following considerations: It had been shown that the treatment with fresh zinc chloride solution for a sufficient length of time would dissolve most of the lime left in the precipitate. Hence a series of cyclic leaches of ore, with purification and precipitation of the liquor during each cycle was designed. The precipitate of each test was partly dewatered and then treated with fresh solution from the succeeding leach, followed by dewatering and treatment with the fresh solution of the next succeeding leach. In this way the zinc chloride solutions were treated by countercurrent agitation and thickening with the lime precipitant. The final precipitate was further washed with water and the wash water was analyzed for zinc. Then the zinc hydroxide precipitate was ignited to form zinc oxide, and to drive off all zinc chloride so that it might be recovered and retreated in solution.

The ore used for these tests was from the Bullion Coalition mine, in the Stockton district of Utah. It was mixed with sulphuric acid in amount equivalent to the zinc in the ore, and was calcined at 700° C. in order to break up all colloidal silica, iron sulphate, and aluminum sulphate, leaving only zinc sulphate to be leached with the calcium chloride solution returned from precipitation of the previous cycle. In this way calcium sulphate was precipitated in the pulp. Then chlorine gas was bubbled through the pulp till it

smelled strongly, after which ground calcium carbonate was added and the pulp was agitated for two hours to cause hydrolysis and precipitation of iron, aluminum, and manganese. The pulp was then ready for filtration and precipitation.

The data on these cyclic leaching and precipitation tests is contained in Table 35. The high percentage of manganese in the second precipitate was thought to be due to the use of lime in excess of the theoretical proportion. In nearly every test the solution was agitated for about four hours after the lime was added, but in the eighth and ninth tests only about two hours' time was allowed, which accounts for the higher proportion of lime in the precipitates from these two tests. The chlorine content in the precipitates varied considerably as they tended to crack and shrink while on the filter, with the result that good washing was difficult; hence various amounts of zinc chloride were left in them. It is possible that repulping of this precipitate with water, followed by a second filtering would be necessary.

The precipitates were also analyzed for sulphates, and surprisingly large amounts were found. Later, it was determined that the amount of sulphates present in the final precipitate was very nearly equivalent to the amount of gypsum that can be dissolved in the zinc chloride solution. The remedy would be to use solutions containing higher proportions of zinc and also to use a slight excess of calcium chloride in order to lower the solubility of the calcium sulphate due to the "common ion" effect.

After drying, weighing, and analysis, the precipitates were ignited at a low red heat, in order to form zinc oxide and to drive off any zinc chloride present. After burning, most of the precipitates had a yellow tinge. The analysis of the ignited oxide shows that it was still considerably contaminated with calcium sulphate.

TABLE 35.—Results of cyclic leaching and precipitation tests.

[Test performed May 1, 1916, by C. W. Frith and O. E. Young.]

Precipitate No.	Quantity of solution used.	Quantity of zinc in solution.	Weight of precipitate.	Analysis of precipitate.								Zinc content of precipitate after burning.	Barren solution.		Wash water.		Total zinc recovered.			
				Zn.		Fe.	Mn.	CaO.	MgO.	Cl.	SO ₄ .		Zinc volatilized.	Quantity.	Zinc content.			Quantity used.	Zinc content.	
				Per cent.	Grams.										Per cent.	Grams.			Per cent.	Grams.
G. c.	Gms.	Gms.	Gms.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	G. c.	P. ct.	G. c.	P. ct.	Gms.				
1	500	15.6	31.0	50.8	15.8	0.75	0.207	2.31	None.	3.61	7.7	67.1	450	0.25	1.12	100	1.62	13.54		
2	500	16.6	42.0	50.4	21.2	12	1.54	3.08	None.	17.05	1.65	65.1	400	0.05	1.20	138	1.14	22.54		
3	500	16.6	10.0	53.0	5.3	18	.27	3.28	None.	9.78	5.70	67.5	480	0.15	.720	102	.87	6.86		
4	500	16.6	27.0	49.8	18	.208	4.6	4.08	None.	7.45	12.50	62.8	360	0.15	.417	250	.785	13.18		
5	500	16.6	27.0	51.0	13.8	28	.54	3.32	None.	12.95	4.69	65.2	430	0.10	.43	124	.96	13.41		
6	500	16.6	29.65	55.7	16.5	20	.207	3.20	None.	11.00	3.08	71.4	600	0.05	.30	173	1.73	18.53		
7	500	16.6	20.30	53.60	10.9	23	.234	3.20	None.	9.26	7.95	67.6	575	0.30	1.72	210	1.57	13.81		
8	500	16.6	27.6	48.3	13.3	.085	7.17	6.76	None.	8.42	10.40	58.4	207	0.25	1.32	210	.62	14.84		
9	500	16.6	22.70	45.0	10.2	.092	1.34	6.76	None.	7.05	13.70	63.7	550	0.30	1.65	210	.53	13.15		
10	500	21.6	54.6	52.0	28.4	.04	.268	4.87	None.	10.60	12.30	64.5	1,090	1.50	2.72	200	1.00	33.12		
11	500	21.6											1,680	.25	10.20			10.20		
12	500	21.6											1,215	2.40	29.16			29.16		

Total quantity of Zn in the solution was 214.2 grams; total quantity of zinc in the precipitate and in the solution after the precipitate was filtered off was 209.34 grams.

From this set of tests the following conclusions may be drawn:

1. It is possible to treat ores with calcium chloride and sulphuric acid to obtain zinc chloride solutions containing only small amounts of dissolved calcium sulphate.

2. These solutions can be purified of iron, aluminum, and manganese by the use of chlorine gas followed by the use of crushed lime rock, which causes hydrolysis of the highly oxidized compounds of these metals, the generation of calcium chloride during hydrolysis precipitating some of the calcium sulphate dissolved in the zinc chloride solution.

3. Precipitation with lime gives a hydrate of zinc and regenerates calcium chloride for use in the next cycle.

4. The main impurities of the zinc hydrate are excess calcium hydroxide, calcium sulphate, calcium chloride and zinc chloride. More than 8 hours' contact of solution with the lime is necessary for converting all the calcium hydroxide to the soluble calcium chloride. Careful washing will remove most of the calcium chloride and much of the zinc chloride. During ignition to the form of oxide, most of the remaining zinc chloride is volatilized. The content of calcium sulphate can be kept down by using solutions containing more than 5 per cent zinc and by adding an excess of calcium chloride to the zinc chloride solution.

5. About 6 per cent of the total zinc content in the zinc hydroxide precipitate is present as zinc chloride, which is volatilized during ignition to the oxide.

6. With 3.5 per cent zinc solutions the final zinc oxide product will average over 65 per cent zinc.

7. No filtration or thickening difficulties are encountered.

BISULPHITE SOLUTIONS.

The employment of bisulphite solutions as a means of recovering zinc has attracted some attention in times past, so that the literature is full of speculations and arguments as to the advantages of sulphurous acid leaching of zinc, but to date no one has been able to handle the precipitation problem satisfactorily.

It has been proposed to recover the zinc as the monosulphite from such solutions by heating them to a sufficient temperature to drive off the extra sulphur dioxide. This sulphur dioxide was to be used over again in the leaching step of the process. Tests of sulphurous acid leaching made at the Salt Lake City station and of sulphurous acid as a solvent are described in another part of this bulletin. Practically all of the zinc in the bisulphite solutions could be precipitated as insoluble zinc monosulphite by boiling, but the solution had to be boiled till more than half of the water had been evaporated. Further, the zinc bisulphite solutions oxidized rapidly, so that the solutions tested contained nearly 50 per cent of the zinc as sulphate.

As the small-scale laboratory tests probably afforded a better chance for air to act on the surface of the solution than would probably be found in practice, the tests were repeated, care being taken to prepare a fresh solution which had had a minimum contact with the air. Even then 33 per cent of the zinc oxidized to the sulphate condition before the precipitation tests by boiling could be performed. On that account, in any process involving the precipitation of zinc bisulphite solutions provision must also be made for precipitating zinc sulphate. This necessity has led some to propose evaporating the solution to dryness and recovering only zinc sulphate, which could be sold as such or calcined to form sulphur dioxide and zinc oxide. The cost of evaporation would be a serious objection to such a method, as not more than a 10 per cent zinc solution can be prepared and the amount of water to be evaporated is too large.

Also, tests were made of the method of precipitating such solutions by the addition of enough zinc oxide from a later stage of the process to neutralize the acidity due to sulphurous acid and to the bisulphite of zinc. This would form zinc monosulphite, which is insoluble and should precipitate. On filtering the precipitate from the solution and calcining it, the zinc monosulphite breaks up into sulphur dioxide and zinc oxide and no solution has to be evaporated. This method worked very well with the zinc bisulphite solutions, but zinc sulphate solutions would not precipitate. Consequently, this method would not meet the requirements mentioned of having a precipitant which would recover the zinc from both zinc bisulphite and zinc sulphate solutions, but was preferable to heating the solution of zinc bisulphite.

Ammonia will precipitate zinc from either sulphate or bisulphite solutions, after which the ammonia can be recovered from the precipitated solutions by boiling with lime. However, absorption of ammonium compounds by the precipitated zinc hydroxide, together with mechanical losses of the ammonia, might make this process unattractive. Sodium hydroxide will also precipitate the zinc from both forms, but is too expensive.

SUMMARY.

Summarizing, the precipitation of zinc from its various solutions constitutes the major problem in the hydrometallurgy of zinc. Electrolytic precipitation is only being perfected and the installation costs of an electrolytic zinc plant are so great that such a process could be used only for the treatment of large bodies of ore or in a custom plant. Chemical precipitation of a zinc oxide product from most of the solutions that are capable of commercial preparation is difficult. Zinc chloride solutions are easily precipitated by lime, although the product is not of the highest grade. Sulphate solutions of zinc can not be precipitated economically by any known direct precipitation process, but can be precipitated after conversion to zinc chloride. The sulphite solutions of zinc deserve further study.

OXIDIZED ZINC ORES.

INTRODUCTION.

Beneficiation of low-grade oxidized ores of zinc has long been a baffling metallurgical problem, and satisfactory methods of treatment have still to be worked out. Most ores of this type are ocherous and earthy and can not be concentrated mechanically. On that account such ores are not worked for their zinc content alone unless they are of sufficiently high grade for direct shipment to the smelter. Throughout the intermountain western region are deposits of oxidized zinc ore containing as high as 25 per cent zinc which can not be concentrated by any known method and is rarely accepted by zinc smelters. For a time, shortly after the European war sent the price of zinc up, ores with as low as 20 per cent zinc content were shipped from the intermountain States to the zinc smelters in the gas belt, because the smelters did not have sufficient roaster capacity and wished oxidized ores in order to keep the distillation furnaces going at full capacity while the roasting equipment was being augmented.

CONCENTRATION PROCESSES.

GRAVITY CONCENTRATION.

As mentioned, the ores containing oxidized zinc minerals are usually too ocherous and clay-like to permit mechanical separation. A few ores are relatively "free" and can be concentrated by jigs, tables, and other gravity concentration machines. The calamine ores of Arkansas, which are being concentrated and shipped to zinc smelters, are an example of this type of "free" ore. Ores containing 2 to 10 per cent zinc are the ones usually mined and milled in this way, the Joplin type of wet mill being in favor. Needless to say, all of the zinc mineral in the more finely divided ore is lost, and the slime problem is important; flotation has not been satisfactory. Hence, recoveries by gravity concentration vary from 40 to 70 per cent, probably averaging about 60 per cent. The oxidized zinc ores of the intermountain western region are usually too intimately associated with the gangue material to be amenable to this type of treatment. In Arkansas and Missouri the oxidized zinc ores were formed from the oxidation, in place, of blende coarsely disseminated in a flint or chert gangue, whereas those of the intermountain region are from oxidation of contact metamorphic deposits or of replacement deposits and are usually contaminated with the oxidized minerals of iron, lime, magnesia, manganese, and other metals. Much of this

ore is so yellow with limonite that individual particles of smithsonite or of calamine are very difficult to distinguish. It is these ores that resist gravity concentration.

FLOTATION.^a

As in most western oxidized zinc ores the minerals are finely inter-crystallized, concentration of such ores by fine grinding and flotation seemed possible. Sulphidizing and flotation has become popular for the treatment of oxidized ores of lead and of copper, and it was thought the same method might be applied to oxidized zinc ores.

However, in none of the ores tested could any apparent concentration be made of the zinc carbonate and zinc silicate minerals by the usual sulphidizing methods. In fact the flotation froth from the yellowish ocherous ores from Utah, Nevada, and Colorado was often slightly lower in zinc than the tailing. Sulphureted oils, ammonium sulphide, and other such reagents all failed.

Mr. Frank Bird, of Salt Lake City, reported that by sulphidizing with sodium sulphide followed by the use of oleic acid as a flotation oil, he was able to obtain a partial flotation of oxidized zinc minerals. By making up a synthetic ore of zinc carbonate and quartz it was possible to verify his tests, but when the method was applied to a number of natural ores, high in lime, the result was that the lime was floated and the zinc minerals were left behind with the other gangue minerals. Supposedly a superficial film of metallic oleates is formed in the presence of sodium hydroxide, and these oleates are easily "oiled" by the flotation oil. Possibly resinates could be used for the same purpose, as is probably being done at the plant of the Chino Copper Co. at Hurley, N. Mex., where copper carbonates are treated with a solution containing sodium sulphide, sodium resinate, etc. However, commercially valuable results in the flotation of zinc carbonate by any of these methods were not obtained in the tests at the Salt Lake City station.

Where a small amount of lead carbonate was present with the zinc carbonate, usually the lead carbonate could be sulphidized and floated in the presence of the zinc, providing no manganese dioxide, lead peroxide, basic sulphates of iron, or other elements deleterious to sulphidizing were present.

MAGNETIC SEPARATION OF LIMONITE AND OXIDIZED ZINC MINERALS.^b

Magnetic separation of limonite in oxidized ores of zinc was deemed possible because a very slight reducing roast is reputed to render limonite "magnetic," so that it could be removed from the ore with an ordinary low intensity magnetic separator.

^a Experimenters: R. W. Johnson and A. J. McChrystal.

^b Experimenters: S. S. Arents and O. C. Ralston.

Tests were made of a sample of ore from the Bullion Coalition mine. The results of an ultimate analysis of this ore are given in the following table, the mineralogic composition, as calculated from this analysis, being included.

Composition of ore from Bullion Coalition mine.

Ultimate analysis.		Mineralogic composition (calculated).	
	Per cent.		Per cent.
Insoluble.....	12.5	Kaolin.....	22.02
CaO.....	1.1	Calcite.....	1.97
Fe.....	15.0	Smithsonite.....	44.65
Al ₂ O ₃	2.6	Calamine.....	4.66
Zn.....	30.4	Anglesite.....	.31
Pb.....	.21	Cerrusite.....	.00
Cu.....	.13	Pyrite.....	2.25
S.....	.92	Limonite.....	22.65
CO ₂	19.04	Malachite.....	.23
Ag.....	0.15		
		Total.....	99.75

• Ounces per ton.

In appearance the yellow ochreous limonite predominated and seemed to be plastered over the particles of zinc carbonate. The latter were occasionally visible as large white specks, but in the greater part of the ore were indistinguishable.

The material was crushed to pass a 20-mesh screen, mixed with 5 per cent of coal dust, and heated in a muffle furnace out of contact with the air for two hours. The weight of the resulting calcine was only 85.5 per cent of the original weight. Of this calcine 40 per cent was separated on a low-intensity Campbell magnetic separator. The magnetic material analyzed 22.3 per cent zinc. The other 45.5 per cent of the ore contained 38.2 per cent zinc, a product which could easily be sold, as prices for oxidized zinc ore are figured on a basis of 35 per cent zinc. Normally a 30 per cent zinc ore can not be shipped from Utah to the "gas belt" at a profit on account of freight costs.

With prewar conditions and 5-cent spelter, the net value in Salt Lake City of 1 ton of "carbonate" ore containing 30 per cent zinc would vary from nothing to \$5, whereas that of a ton of 38 per cent zinc ore under the same conditions would be about \$12.50. As mining costs have to be paid out of this net return and the higher grade ore has a sure market, while the price paid for the lower grade ore fluctuates according to the conditions of the stock piles at the zinc smelters, such ore could easily be treated at a profit by magnetic separation, although the reject contains 22.3 per cent zinc—30 per cent of the total zinc in the ore. The low recovery of zinc, however, would normally condemn such a procedure.

Many small-scale tests were made in order to determine the effects of various percentages of reducing agent, different lengths of time,

and different temperatures of reduction. The averages of the best results showed that on nearly all different sizes it was possible to obtain a nonmagnetic residue containing 40 per cent zinc and weighing about 42 per cent of the original ore, and a magnetic product containing 21.8 per cent zinc and also weighing about 42 per cent of the original ore. This latter work was done with a sample containing only 24.82 per cent zinc.

None of the zinc in the magnetic product could be separated, on account of the intimate crystallization of the zinc with the iron minerals. The ore used is representative of much of the oxidized brown "carbonate" ore of the Rocky Mountain mining districts.

CALCINING OXIDIZED ZINC ORES.*

Calcining oxidized zinc ores as a method of concentration has been repeatedly proposed. The fundamental principle of this treatment is that the water of hydration and the combined carbon dioxide in the ore can be driven off, leaving all the zinc and the other metals in a product of much less weight and consequently higher grade. There is no doubt that calcining any zinc ore which is normally of shipping grade, but which is at some distance from the zinc smelters, will pay. For instance, with the oxidized zinc ores of Nevada, the freight rates to the "gas belt" are \$8 to \$11 per ton; hence a loss in weight by the ore amounting to 25 or 30 per cent effects an important saving.

A number of such ores were calcined in the laboratory by roasting 100-gram samples in dishes of 5-inch diameter at 800° C. for one to two hours. The roasted samples, on standing in the laboratory for a number of days, did not take up moisture and carbon dioxide to any serious extent; as shown by the figures in Table 36, but in some samples the lime slaked vigorously when they were wetted with water. Therefore such calcined ore would have to be shipped in closed cars to keep it dry and prevent its increasing in weight again. As the normal condition of transportation is such that the railroads prefer loading eastbound zinc ore in box cars, this would be no disadvantage.

The figures in the table show that few nonshipping ores would be raised to shipping grade, but that with the shipping ores important savings in freight would be effected and a slight concentration of the zinc value, which on some contracts would more than pay for the cost of calcining.

The analyses of these ores are found in Table 3 (p. 21).

* Experimenters: H. J. Morgan, H. C. Neeld, and W. B. Sholes.

TABLE 36.—*Results of calcining oxidized zinc ores.*

[100-gram lots calcined 2 hours at 800° C.]

Mine and sample.	Before heating.		After heating.		Weight at—			
	Zinc.	Lead.	Zinc.	Lead.	Begin- ning.	7 days.	12 days.	16 days.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>
Seranton, No. 1	25.6	11.7	31.4	11.0	82.4	83.0	83.7	83.8
Seranton, No. 2	8.0	.....	10.9	.....	83.4	84.5	85.3	85.6
Seranton, No. 3	17.9	.....	22.0	.....	77.8	80.3	81.3	81.8
Lower Mammoth, No. 1	9.0	.....	8.9	.....	84.9	84.9	84.9	84.9
Lower Mammoth, No. 2	11.4	.....	11.4	.....	86.1	86.1	86.1	86.1
Lower Mammoth, No. 3	12.0	.....	12.0	.....	85.5	85.5	85.5	85.5
Bullion Coalition, No. 13	25.5	.....	30.5	.....	82.2	82.2	82.3	82.4
Yellow Pine, No. 1	31.6	17.6	38.9	18.0	76.5	76.8	77.1	77.3
May Day, No. 4	23.1	13.9	26.7	12.6	82.3	83.9	85.1	85.2
Lake View, No. 104	23.3	26.2	27.8	29.2	79.8	79.8	79.9	79.9
Lake View, No. 106	28.2	.....	38.0	.....	77.9	80.6	83.1	84.3
Lake View, No. 107	9.3	13.6	16.6	17.0	67.4	67.7	67.9	67.9
Santaquin King	44.7	.....	47.7	.....	92.0	92.0	92.0	92.2
Western Mining Co.	20.0	.....	22.4	.....	82.0	82.0	82.1	82.1

IGNEOUS CONCENTRATION.^a

By igneous concentration of oxidized zinc ores is meant that process in which the ore is mixed with an excess of fuel and heated under forced draft so that zinc distills out of the ore and reoxidizes in the air to form zinc oxide fume, which is later filtered from the flue gases. Most of the commercial zinc oxide in the United States is made in this manner, although the mechanical equipment used for the process varies widely. The increased use of zinc oxide in paints, for filling rubber, and other purposes, make this process of importance. It is said that some automobile tires contain 60 per cent ZnO. Further, the process seems to offer a solution of the problem of treating low-grade oxidized ores of zinc which are amenable to no other concentration process.

WETHERILL GRATE FURNACE.

The best known furnace in which zinc oxide is made from oxidized ores is the Wetherill^b grate furnace, which is built much like the fire box under a large stationary boiler. The mixed ore and fuel (coke breeze or anthracite coal slack) is dropped on the grates in a bed 4 inches to 12 inches deep. The air is blown in under the grates and thus keeps them relatively cool. The ore bed is heated to 1,100° to 1,300° C. by the combustion of part of the fuel; at this temperature the zinc is reduced and distilled from the ore particles but reoxidizes in the excess of air which is blown into the furnace. After partial cooling of the gases they are filtered in a bag house to remove the fume of zinc oxide. The grates differ somewhat in

^a Experimenters: H. C. Neeld, J. F. Cullen, R. H. Bradford, and O. C. Ralston.^b Stone, G. C., Oxide of zinc: Bull. 129, Am. Inst. Min. Eng., September, 1917, pp. 1217-1228.

design, some being hollow and filled with holes from which the air is blown into the mass, and others being like ordinary boiler grates. In nearly all of them the air openings are tapered, with the largest diameter at the bottom in order to prevent blinding. The grates are charged and discharged by hand, so that the cost of labor involved is rather large. In addition the grates tend to buckle and have to be removed periodically from the hot furnaces and replaced by fresh grates. The buckled members are heated uniformly in a special furnace and then straightened.

Another type of furnace used is very similar to the ordinary zinc retort furnace except that an air pipe is led to the back of each muffle and zinc oxide is driven off instead of metallic zinc. This furnace likewise requires much hand labor, and, being a retort furnace, has a rather high fuel consumption.

A rotary cement kiln is reported to have been used as a furnace at a plant in Mexico. The ore was fed continuously into the cool end and discharged at the hot end, and a reducing atmosphere was maintained. This distilled all the zinc, which reoxidized in the flue gases. The fuel consumption was said to amount to about 15 per cent of fuel oil based on the weight of the charge. This method has the advantage over the two previously described methods that all the fuel is used in the flame that heats the furnace, so that a reducing atmosphere is easily obtained. The writers have not been informed whether the zinc oxide product was sufficiently pure for use as pigment. However, evidently air could be mixed with the hot gases in a combustion chamber at the head of the kiln in order that all carbon might be burned and the zinc oxidized completely. Rotary kilns often make much dust, but most of this could be caught in a settling chamber, so that the zinc oxide product need contain no more dust than that made on Wetherill grates. For making pigment the kiln would have to be fired with either oil or gas and not with powdered coal, because the ash would contaminate the zinc oxide. Ash contamination might not be serious if the purpose was to make a high-grade concentrate for the zinc smelter rather than pigment. The only disadvantage of this type of furnace for igneous concentration of zinc ores is in the power necessary to turn a heavy kiln.

A blast furnace would be a much better type for continuous mechanical feeding and firing, and would use most of the power for the blast. A number of attempts have been made^a to blow zinc oxide in blast furnaces, but one great drawback to the method has been that a slag has to be formed to facilitate removal of the residue. When the usual types of slags were made the zinc oxide tended to

^a Ingalls, W. R., Zinc burning as a metallurgical process: Bull. 129, Am. Inst. Min. Eng., September, 1917, pp. 1229-1234.

enter the slag instead of entering the fume. One of the latest attempts was that of R. D. Divine and B. F. Hedges to recover zinc in a lead blast furnace at the old South Chicago plant of the American Smelting & Refining Co.^a The material treated was a zinciferous lead-smelting slag. Only 60 per cent of the zinc could be blown before the slag melted and ran out of the furnace. A similar plant,^b making similar recoveries, is now in operation at Florence, Colo.

With these results in mind, some experiments in the blast furnace treatment of such ores were made at the Salt Lake City station, with the object of blowing more of the zinc into the fume, if possible. A small "homemade" blast furnace was constructed from fire brick and sheet iron, as shown in figure 10. The three tuyères were made of iron pipe, and as they burned off they were pushed farther into the furnace. The pipes leading to the tuyères from the air main were made of 2-inch canvas hose, so that they could be pinched down till the right amount of air was being used. The fire-brick lining of the furnace melted away several times during the course of about 25 runs, but was easily replaced and served the purpose, although a standard water-jacketed lead blast furnace would be needed for large-scale work.

The inside dimensions of this furnace were about 5½ feet in height, 1 foot in diameter at the top, and 18 inches in diameter at the bottom to prevent hanging. After heating the furnace with any convenient type of fuel the charges were added with various percentages of coke fuel. In each test the residue was drained out of the furnace before another charge of different composition was used. The slag analysis served as an index of the completeness of volatilization of the zinc from the ore. Under these conditions such a furnace could easily melt 2 or 3 tons of ore daily, although it was not run continuously for more than a few hours, a

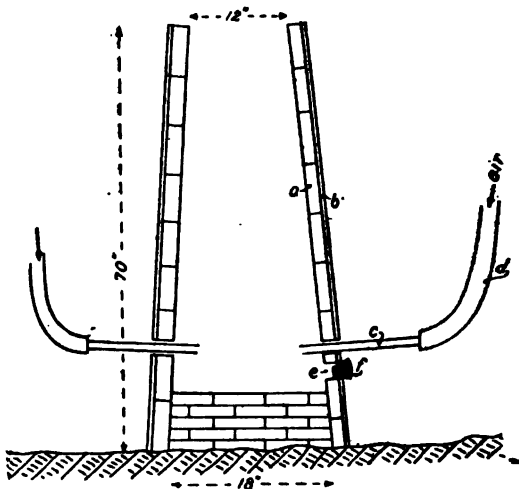


FIGURE 10.—Laboratory blast furnace used for zinc-oxide experiments. a, Fire-brick lining; b, sheet-iron casing; c, 1½-inch iron pipe; d, 2-inch canvas hose; e, slag notch; f, fire-clay plug.

^a Fuksifer, H. G., Zinc oxide from lead blast-furnace slag, South Chicago: *Met. and Chem. Eng.*, vol. 12, Nov. 1, 1915, pp. 783-785.

^b Hall, R. G., Some economic factors in the production of electrolytic zinc: *Bull. 120, Am. Inst. Min. Eng.*, September, 1917, pp. 1287-1302.

wheel-barrow load being used to a charge, and only in the daytime. On that account the fuel consumption is doubtless too high, varying from 25 to 33 per cent of coke, based on the weight of the ore.

At first the standard lead-smelting slags containing various proportions of iron, silica, and lime were aimed at, but the recoveries of zinc were low, varying from 10 to 50 per cent. Slags so calculated that an excess of one of the slag-forming constituents over the others was used gave much better results. If lime or silica were used in excess, 80 to 95 per cent of the total zinc was obtained, but the slag had a much higher melting point, and more fuel was needed to make it pass from the furnace. Presumably the use of slag with a high melting point permits all the zinc to distill from the ore before the gangue is fluxed; thus, the slag has no opportunity to take up zinc oxide. The use of a high percentage of lime might well be expected chemically to displace zinc from the slag, but the successful use of a high percentage of silica can be explained only on the assumption that the formation temperature of the slag is raised above the boiling point of zinc. In fact, one slag containing 67 per cent SiO_2 was formed during a series of tests with increasing amounts of silica. This slag was so sticky that the tap hole had to be drilled and the slag removed by "balling" on the end of a cold iron rod thrust through the hole.

The results of some of these tests are tabulated in Table 37. Recoveries were low with the high-iron slags, but good recoveries were obtained with the high-lime, high-silica, or high-alumina slags. Slags which are unusual in lead, copper, or iron blast-furnace work were formed in this small furnace and removed with very little trouble. The small size of the furnace permitted quick adjustment of the air blast when the slag seemed in danger of sticking; also sticky slag could be removed by balling whenever the furnace was freezing. However, the slag need not be unbalanced to the danger point in order to get as much as 85 per cent recovery of the zinc.

TABLE 37.—*Results of igneous concentration of oxidized zinc ore in a small blast furnace.*

Slag analysis.					Zinc recovery.	Remarks.
SiO_2 .	CaO .	FeO .	Al_2O_3 .	Zn.		
<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	
34.0	15.0	30.0	-----	10.0	50	Charge finely crushed; slag fluid.
46.2	14.4	17.9	12.0	6.4	67	Slag ran freely.
42.0	19.0	21.0	8.0	4.6	75	
39.0	24.0	15.0	8.4	6.4	73	Slag very fluid.
39.0	25.0	12.0	7.0	5.0	76	
35.4	24.7	15.0	6.9	4.7	83	
40.0	25.9	13.7	11.6	6.0	74	
50.0	29.8	9.0	8.1	2.5	88	
51.4	17.8	13.4	12.2	2.5	88	
48.0	19.0	11.0	15.9	2.4	85	
52.0	13.0	12.0	18.0	1.7	84	
67.0	6.2	11.0	16.9	3.5	60	Furnace froze.

Some of the most difficult zinc ores to handle by present commercial methods are the partly oxidized ores in which only the sulphide of zinc can be concentrated. The results of four tests of oxidized ores containing some zinc sulphide are recorded in Table 38. These indicate that the presence of as much as 10 per cent sulphur does not affect the zinc recovery. The ore used was from the Daly-Judge mine at Park City, Utah, and in addition to zinc sulphide also contained sulphide of lead. No lead collected in the bottom of the furnace, and the final slag contained only traces of that metal; consequently, the lead went into the zinc oxide and the product made would be a "lead" pigment. A serious drawback to making pigment from such ore by this method is the formation of sulphur compounds, which contaminate the product. On the other hand, in making a zinc concentrate, the presence of lead in the product would be a disadvantage. Hence, for making pigment, a preliminary roasting to drive off the sulphur before igneous concentration might be necessary, whereas if the product were sold as zinc concentrate, the smelter would not pay full value for the zinc on account of the lead present.

Some explanation of the figures in Table 38 is necessary. In all these tests the zinc assays were obtained by decomposing the slag samples with a mixture of nitric and hydrochloric acids, followed by the use of hydrofluoric acid to break up ferrates of zinc. However, only hydrochloric and nitric acids were used in determining the "insoluble", which is not the "absolute silica," hence, the slag analyses are largely of comparative value only.

TABLE 38.—*Results of igneous concentration of low-grade sulphide ores of lead and zinc in a small blast furnace.*

Slag analyses.					Sulphur content of charge.	Zinc re- covery.	Remarks.
Insoluble.	CaO.	FeO.	Al ₂ O ₃ .	Zn.			
<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	
85.0	3.6	6.2	3.4	1.0	11.4	88	Furnace froze.
87.0	3.0	3.7	3.0	2.0	8.5	81	Slag removed with bar.
67.6	11.0	8.7	8.3	1.7	8.5	87	Do.
91.0	2.0	7.8	.....	1.0	8.5	90	Do.

The experience of the River Smelting Co., at Florence, Colo., as mentioned previously, has been that in smelting zinc ore in a blast furnace accretions of zinc oxide and "blue powder" tend to form on the walls of the furnace above the smelting zone. Such masses are so hard to bar down while the furnace is running that the practice is to shut down the furnace every ten days or so for removing the accretions. This method is, consequently, rather more expensive than is desirable. The tests at the Salt Lake City station were not sufficiently extended to observe this trouble.

In order to obtain an idea of the composition of the zinc oxide product and its physical characteristics, several methods were used in collecting it. A wire screen placed across the throat of the blast furnace collected material that contained only about 67 per cent zinc and was contaminated with flue dust. A stream of the furnace gases by-passed through a cold pipe dropped part of its load as a 73 per cent zinc product. Gases from the discharge of the blast furnace sucked through an electrical precipitator comprising a single 4-inch iron pipe to which was applied 18,000 volts, could be almost entirely cleared at velocities ranging up to 18 feet per second, although most of the time a rate of not more than 10 feet per second was maintained. The product, a fluffy white material containing 77.6 per cent zinc, had a slight bluish tint, possibly due to the presence of small amounts of carbon or of some unoxidized zinc (blue powder). There seems to be no reason why this product could not be used for pigment.

The value of the igneous concentration method for concentrating low-grade oxidized ores of zinc may be estimated from the following two representative contracts, which are commonly possible in the marketing of oxidized zinc ores in Utah. With these two contracts as a basis the possible profits from a plant using the process have been calculated.

Oxidized zinc ores are sold at prices calculated on base prices for 35 per cent zinc ore delivered at the smelter. The base prices for 35 per cent zinc ore are as follows: \$17 a ton when spelter is 5 cents per pound, \$29 when spelter is 8 cents, and \$50 when spelter is 15 cents. The base price changes \$3 per ton for every change of 1 cent per pound in the price of spelter between 8 cents and 15 cents, and \$4 for every change of 1 cent in price between 5 cents and 8 cents. For ore containing less than 35 per cent zinc, a penalty of \$2.50 per unit is charged for each 1 per cent deficiency in zinc as far as 30 per cent, and \$2 per unit for each deficiency of 1 per cent below 30 per cent zinc content. A credit of \$1 per unit is allowed for each 1 per cent of zinc the ore contains in excess of 35 per cent. The freight rate to the "gas belt" where the zinc ores are smelted is \$7.50 per ton of ore.

From these figures the net values of oxidized zinc ores in Salt Lake City have been calculated and plotted as shown in figure 11. It can be seen that with normal 5-cent spelter the lowest grade of ore which can be shipped from Salt Lake City to the "gas belt" is about 31.5 per cent zinc ore. With spelter at 8 cents the lowest grade possible is 26.2 per cent zinc ore. Contracts vary somewhat, so that the minimum zinc content for different contracts may vary 2 or 3 per cent zinc in either direction from the figures given.

For the sale of zinc oxide concentrate the scale of ore values given might be used in calculating the value of the product. The net value in Salt Lake City of such concentrate for different percentages of zinc and for different market prices of spelter has been calculated and plotted on the solid-line curves in figure 12. As

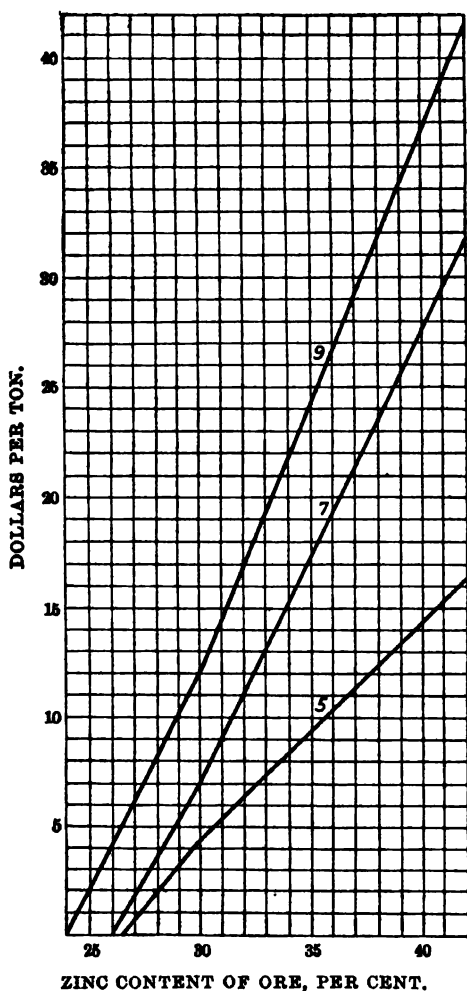


FIGURE 11.—Curves showing net smelter prices for oxidized zinc ores at Salt Lake City, for ores of varying zinc content. Figure near each curve shows price in cents per pound for spelter based on "35 per cent zinc" ore.

the credit for each extra unit of zinc above 35 per cent zinc is only \$1, even when spelter is selling at 10 cents, the contract price for the zinc oxide when spelter is selling at 7 cents or better is too low.

A better offer is one made tentatively by a zinc-smelting company which said it was willing to pay for a ton of zinc oxide product containing 75 per cent zinc a base price of 48.75 per cent of the price of a ton of spelter on the day of sale. Thus an 80 per cent zinc product would bring 80/75 of the base price and a 70 per cent zinc product, 70/75 of the base price. The value under these terms of zinc oxide concentrate for varying conditions is also plotted in figure 12 for comparison with the rates paid under the ore contract mentioned. A comparison of the sale prices of zinc oxide under these two contracts shows that with 5-cent spelter the ore contract offers the best price, but with spelter at 7 cents or more the oxide contract offers the best price. In fact, the difference between the two contracts is so marked

that careful arrangements would have to be made in regard to the sale of the zinc oxide before commercial production by the process proposed could be undertaken. The zinc smelting company making the offer mentioned wished to have a trial carload of the oxide product before it would close the contract, and thus might bid lower for the next car.

If the oxide product were acceptable as pigment, as it should be, it would probably bring a higher price than is shown by either of the two methods used, but this consideration was eliminated in making the calculations, in order to show only the minimum possible returns.

The cost of a plant for making zinc oxide product would, of course, be dependent on the daily tonnage of ore proposed to be treated. On the supposition that anyone interested in this type of plant would first be concerned in building a small unit in order that every doubt-

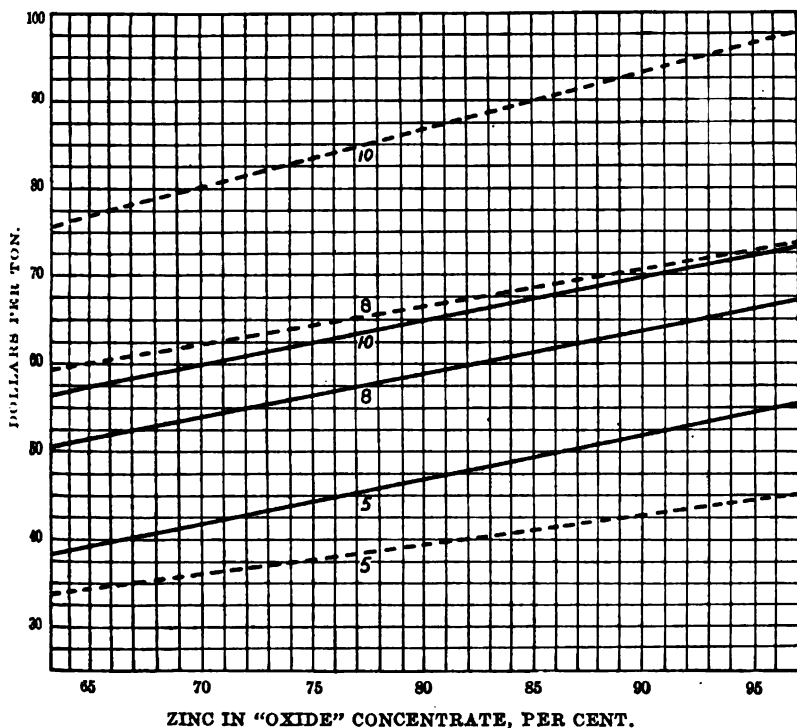
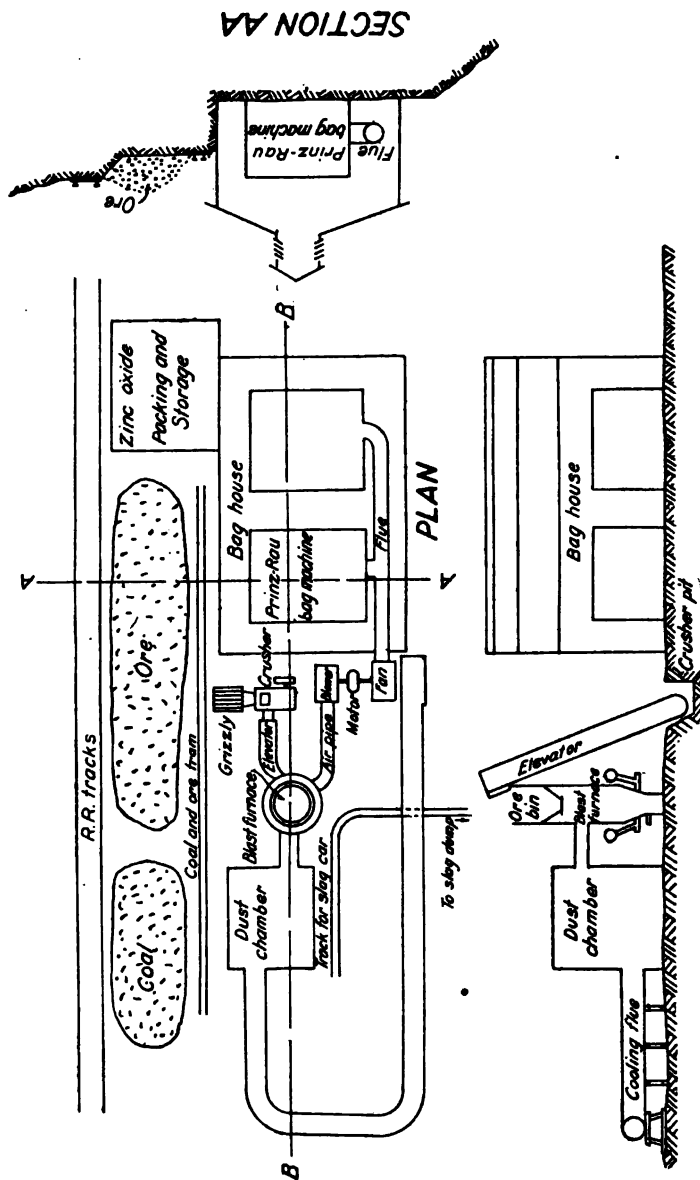


FIGURE 12.—Curves showing change in value of zinc oxide concentrate with varying zinc content. Solid-line curves are based on "ore" contract; dotted-line curves on "zinc oxide" contract. Figure near each curve shows price in cents per pound for spelter based on "35 per cent zinc" ore.

ful point might be tested out, the necessary data for estimating the cost of a plant capable of treating 25 tons of ore per 24 hours is presented. The two most important figures that need to be known in order to design such a plant are the volume of air used and the rate of cooling of the hot gases. The figures chosen represent the average amount of air commonly used in lead blast furnaces when they are run with hot tops, and the average rate of cooling of gases in iron flues at a number of smelters. Thus the assumption is made that 200 cubic feet of air per minute is needed per square foot of furnace area measured at the tuyères, and that each square foot of



SECTION BB

FIGURE 13.—Plan and sections of 25-ton zinc-oxide plant.

cooling pipe would radiate 0.025 B. t. u. from the gases. A rough sketch of the plant necessary (not drawn to scale) is shown in figure 13. The itemized costs of construction are as follows:

Cost of a 25-ton plant for igneous concentration of zinc ores.

One 42-inch blast furnace.....	\$1,500
900 feet of cooling pipe, 30 inches in diameter.....	4,000
Two Buffalo blowers, No. 7 size.....	800
One 7 by 10 inch Blake crusher.....	500
Two Prinz Rau bag houses, No. 143 size.....	1,500
One brick-dust chamber.....	500
Supports for pipe.....	400
Connections to furnace.....	200
90-horsepower motor.....	1,000
Lumber.....	500
Buildings.....	1,600
Concrete.....	400
Supplies, etc.....	1,800
Labor and erection.....	3,000
Freight and miscellaneous.....	3,300
Total approximate cost.....	21,000

The furnace chosen could easily handle twice the estimated amount of ore by increasing the blowing equipment and the facilities for handling the slag. The crushing equipment is ample for 50 tons daily, and the only feature that would have to be altered much for increasing the plant to this capacity would be the length or size of the cooling flue and the bag house. The difference in cost for a 50-ton plant would probably not exceed \$5,000. However, all the calculations have been for a 25-ton plant, in order that a rough idea could be obtained of the cost of producing a ton of zinc-oxide concentrate.

On the assumptions that only 80 per cent of the zinc will be recovered, that the product will contain 75 per cent zinc, that 25 per cent of coke on the weight of the ore will be necessary, and that lime rock can be quarried in the vicinity of the plant and delivered for \$1.50 per ton, the cost per ton of ore of treatment in the 25-ton plant will be as shown in Table 39 and plotted in figures 14 and 15. The daily cost of operating the plant will be as follows:

Daily cost of operating 25-ton plant.

	Cost per day.
Depreciation, at 20 per cent.....	\$12.00
Labor, 13 men.....	48.00
Power, 70 horsepower, at 2 cents per horsepower hour.....	35.00
Flux, cooling water, etc.....	8.00
Coke, 6 tons, at \$8.....	48.00
Total metallurgical cost.....	151.00
Mining, at \$2.50 per ton.....	62.50
Total, mining and metallurgical.....	213.50
Total cost per ton.....	8.55

TABLE 39.—*Costs and profits of a 25-ton zinc oxide plant.*

[Cost per ton of ore, based on 80 per cent recovery, 75 per cent zinc in product, \$7.50 per ton of zinc oxide, and freight to "gas belt."]

Spelter, cents per pound.	Zinc in ore (per cent).	Metal- lurgical cost.	Mining cost.	Freight on ZnO.	Total cost.	On oxide contract.		On ore contract.	
						Value of ZnO.	Net profit per ton of ore.	Value of ZnO.	Net profit.
5	10	\$6.05	\$2.50	\$0.75	\$9.30	\$4.90	Loss.	\$5.70	Loss.
5	15	6.05	2.50	1.12	9.67	7.30	Loss.	8.55	Loss.
5	20	6.05	2.50	1.50	10.05	9.80	Loss.	11.40	\$1.35
5	25	6.05	2.50	1.87	10.42	12.20	\$1.78	14.25	3.83
5	30	6.05	2.50	2.25	10.80	14.60	3.80	17.10	6.30
5	35	6.05	2.50	2.62	11.17	17.10	5.93	19.95	8.78
7	10	6.05	2.50	.75	9.30	6.80	Loss.	6.50	Loss.
7	15	6.05	2.50	1.12	9.67	10.25	.58	9.75	.08
7	20	6.05	2.50	1.50	10.05	13.65	3.60	13.00	2.95
7	25	6.05	2.50	1.87	10.42	17.10	6.68	16.25	5.83
7	30	6.05	2.50	2.25	10.80	20.50	9.70	19.50	8.70
7	35	6.05	2.50	2.62	11.17	23.90	12.73	22.75	11.58
9	10	6.05	2.50	.75	9.30	8.75	Loss.	7.20	Loss.
9	15	6.05	2.50	1.12	9.67	13.15	3.48	10.80	1.13
9	20	6.05	2.50	1.50	10.05	17.50	7.45	14.40	4.35
9	25	6.05	2.50	1.87	10.42	21.90	11.48	18.00	7.58
9	30	6.05	2.50	2.25	10.80	26.30	15.50	21.60	10.80
9	35	6.05	2.50	2.62	11.17	30.70	19.53	25.20	14.03

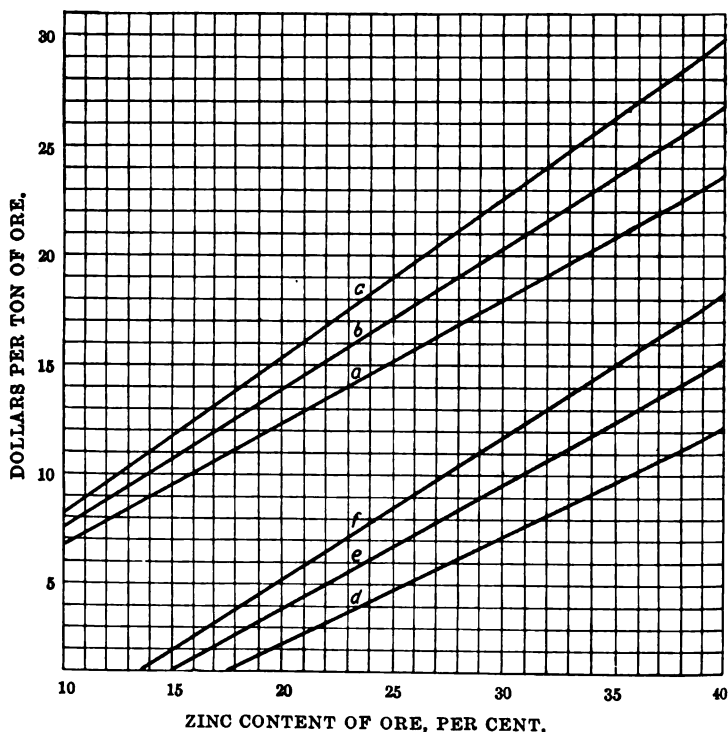


FIGURE 14.—Curves showing cost per ton of ore of operating a 25-ton igneous concentration plant, and returns as calculated from "ore" contract. Curves a, b, and c show value of zinc oxide product and d, e, and f the net profit per ton with spelter at 5, 7, and 9 cents per pound, respectively. Metallurgical cost estimated at \$6.05 and mining cost at \$2.50 per ton; freight on zinc oxide product variable.

For a similar plant treating 50 tons daily the expenses per ton of ore would be less. The original cost of the plant would not be much greater than for a 25-ton plant, and the amount of labor would be only slightly greater than for the 25-ton plant. Likewise the power bill would not be much larger, and the only item that is rela-

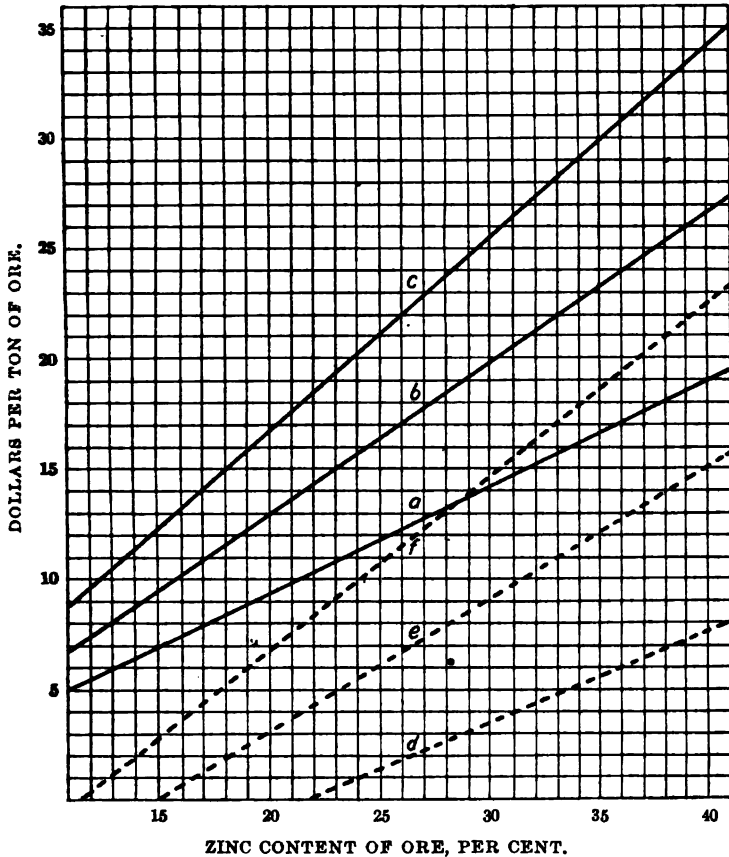


FIGURE 15.—Curves showing cost per ton of ore of operating a 25-ton igneous concentration plant, and returns as calculated from "zinc oxide" contract. Curves a, b, and c show value of zinc oxide product and d, e, and f the net profit with spelter at 5, 7, and 9 cents a pound, respectively. Metallurgical cost is estimated at \$6.05 and mining cost at \$2.50 per ton of ore; freight on zinc oxide product variable.

tively fixed per ton of ore is that of fuel. This makes a probable metallurgical cost of \$4.80 per ton of ore. Mining on this scale could probably be done for \$2 per ton in oxidized deposits near the surface, whereas freight on the zinc-oxide product would be the same as in the former calculations. Thus the returns from a 50-ton plant would be larger, as shown in Table 40 and figures 16 and 17.

TABLE 40.—*Costs and profits of a 50-ton zinc oxide plant.*

[Cost per ton of ore, based on 80 per cent recovery, 75 per cent zinc in product, \$7.50 per ton of zinc oxide, and freight to "gas belt."]

Spelter, cents per pound.	Zinc in ore, per cent.	Total cost per ton.	Oxide contract.		Ore contract.	
			Value of ZnO.	Profit per ton of ore.	Value of ZnO.	Profit per ton of ore.
5	10	\$7.55	\$4.90	Loss.	\$5.70	Loss.
5	15	7.92	7.30	Loss.	8.55	\$0.63
5	20	8.30	9.80	\$1.50	11.40	3.10
5	25	8.67	12.20	3.53	11.25	5.58
5	30	9.05	14.60	5.55	17.10	8.05
5	35	9.42	17.10	7.68	19.95	10.53
7	10	7.55	6.80	Loss.	6.50	Loss.
7	15	7.92	10.25	2.33	9.75	1.83
7	20	8.30	13.65	5.35	13.00	4.70
7	25	8.67	17.10	8.43	16.25	7.58
7	30	9.05	20.50	11.45	19.50	10.45
7	35	9.42	23.90	14.48	22.75	13.33
9	10	7.55	8.75	1.20	7.20	Loss.
9	15	7.92	13.15	5.23	10.80	2.92
9	20	8.30	17.50	9.20	14.40	6.10
9	25	8.67	21.90	13.23	18.00	9.33
9	30	9.05	26.30	17.25	21.60	12.55
9	35	9.42	30.70	21.28	25.20	15.78

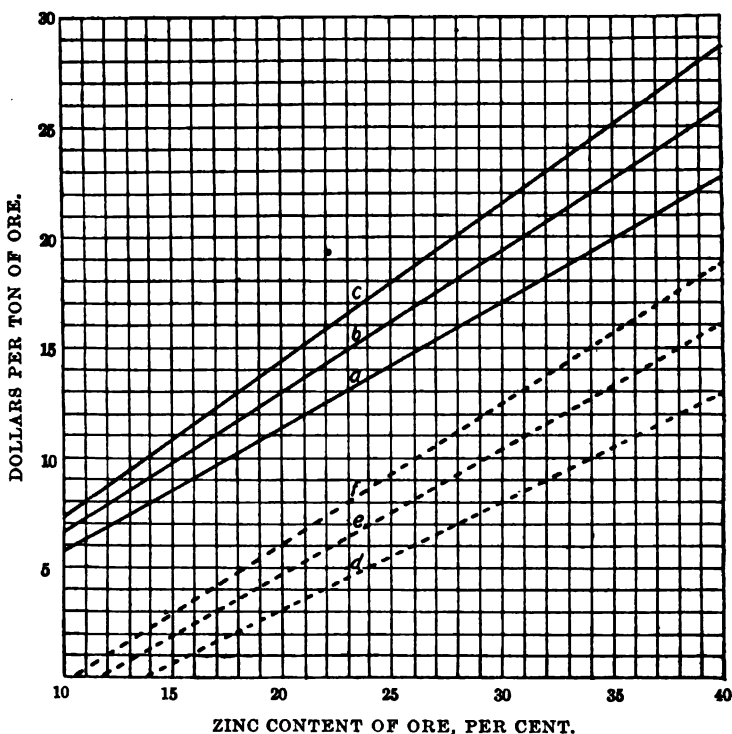


FIGURE 16.—Curves showing cost per ton of ore of operating a 50-ton igneous concentration plant, and returns based on "ore" contract. Curves a, b, and c show value of zinc oxide product, and d, e, and f the net profit with spelter at 5, 7, and 9 cents, respectively. Metallurgical cost is estimated at \$6.05 and mining cost at \$2.50 per ton; freight on product variable.

Both sets of calculations show that the returns depend largely on the kind of contract obtained for the sale of the zinc oxide.

By comparing the curves for the value of the crude ore, as measured by the smelter contract, with those for the returns possible from igneous concentration, it can be seen that ore of about 35 per cent

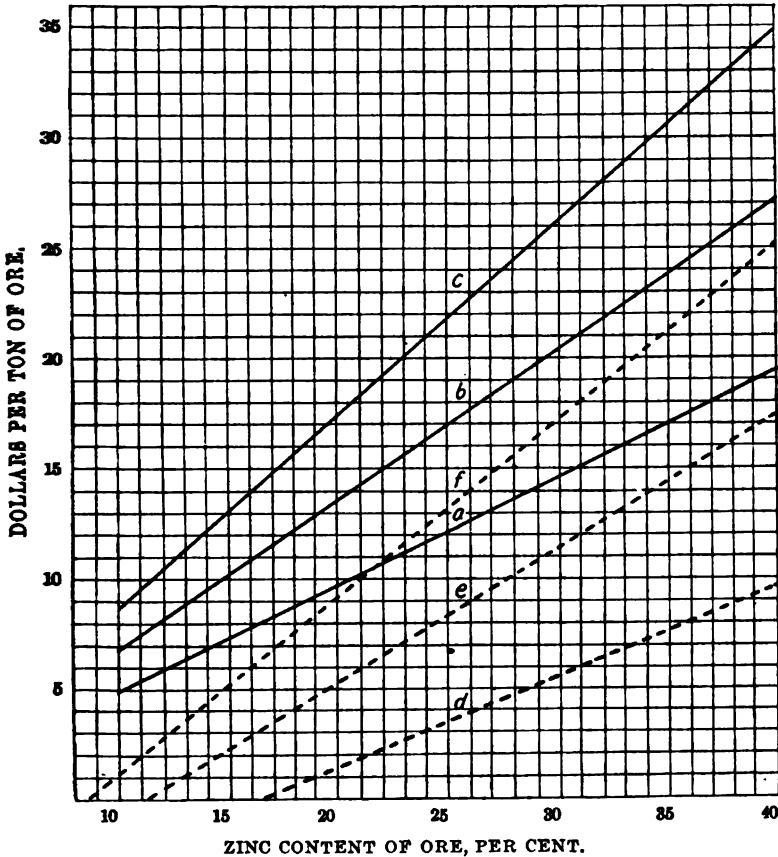


FIGURE 17.—Curves showing cost per ton of ore of operating a 50-ton igneous concentration plant, and returns as calculated from "zinc oxide" contract. Curves *a*, *b*, and *c* show value of zinc oxide product and *d*, *e*, and *f* the net profit with spelter at 5, 7, and 9 cents, respectively. Metallurgical cost is estimated at \$6.05 and mining cost at \$2.50 per ton of ore; freight on product variable.

zinc content brings about as much per ton either way, but that all lower grades of oxidized zinc ores (in the zinc districts of Utah or similarly situated localities) can be made to yield a greater profit by igneous concentration. This was the conclusion sought in doing the work described.

SPECIAL ROASTING PROCESSES FOR OXIDIZED ZINC ORES.^a

At the Salt Lake City station several laboratory experiments have been made in the attempt to find some cheap reagent for obtaining soluble zinc compounds from oxidized ores of zinc without much success.

Chloridizing roasts with sodium chloride showed that it was almost impossible to chloridize all the zinc to soluble form at temperatures ranging from 500° C. to as high as 1,000° C. Both oxidizing and reducing atmospheres and reverberatory furnaces as well as blast roasters, were used.

In blast roasting not more than 25 per cent of the total zinc in the ore could be consistently either chloridized and leached, or volatilized, although erratic results giving recoveries as high as 50 per cent of the zinc were obtained. The presence of pyrite or other sulphides to provide sulphur for aiding the chloridizing reactions seemed to improve matters very little. So far as the authors know there is no easy way of consistently chloridizing oxidized zinc ores with sodium chloride or with combinations of sodium chloride and pyrite in any type of roaster.

The mixing of sulphide ores of zinc with oxidized ores, in the hope that the zinc could be sulphated by slow blast roasting, also gave low results, as not more than a third of the zinc could be made water-soluble.

Chloridizing volatilization involves mixing the ore with sodium chloride, or other chlorides, and heating to a high enough temperature to drive off fumes of zinc chloride. Reverberatory or kiln roasters must be used. Results with this method were erratic, although higher recoveries could be obtained than were possible in the blast roaster. As much as 75 per cent of the zinc in the ore could be consistently recovered if special precautions were taken. The presence of sulphides, such as pyrite, evidently had no beneficial effect on the reaction, but the addition of manganese dioxide and the sulphates of sodium and calcium seemed to be aids in maintaining good recoveries. In almost none of the tests was more than 75 per cent of the zinc obtained.

Other roasting processes, incidental to some of the leaching tests reported in subsequent chapters, are discussed in that connection.

HYDROMETALLURGY OF OXIDIZED ZINC ORES.^b

The oxidized ores of zinc have often been regarded as being the most desirable zinc ores for hydrometallurgical treatment because they contain the zinc in an easily soluble form. The zinc in oxidized ores is usually present as either the carbonate or the silicate, both of which are easily soluble in weak acids. Hence many people, espe-

^a Experimenter: C. L. Larson.

^b Experimenters: J. F. Cullen, W. G. Woolf, A. E. Gartside, H. C. Neeld, O. E. Young, C. W. Frith, R. J. Hinman, and O. C. Ralston.

cially patentees, have claimed that the hydrometallurgical treatment of such ores presents no especial problem. The experience of the writers has been to the contrary and the number of difficulties encountered in the treatment of these ores has been somewhat surprising.

Most of the western oxidized zinc ores are replacement deposits in dolomite or limestone, and as a rule consume large quantities of acid when acid leaching is attempted. Furthermore, such ores nearly always contain a considerable amount of zinc silicate, which forms silicic acid when the ore is leached with weak acid solutions. This silicic acid turns to jelly when the solutions are neutralized, causing difficulty in the filtration of the ore pulp.

At the Salt Lake City station leaching tests were made with sulphuric, hydrochloric, sulphurous, and hydrofluosilicic acids. In every test the lime, magnesia, and other carbonates accompanying the zinc caused high acid consumptions. On that account alkaline leaching solutions were tried; also caustic soda and ammoniacal solutions of various kinds.

ACID EFFICIENCY.

When an ore is treated with an acid for the purpose of recovering a metal such as zinc, the acid can not be regarded as doing useful work if it reacts with any other metals present. Hence the "efficiency" of the acid is the percentage of the total quantity of acid consumed that is actually used in dissolving the metal sought. The object of the first experiments was to compare the properties of sulphuric and hydrochloric acids in leaching a mixed zinc-lime carbonate ore. It was thought that a dilute solution of sulphuric acid might tend to coat the calcium carbonate particles with calcium sulphate, so that the acid would have a better chance to attack the zinc minerals and thus be more efficient than hydrochloric acid.

The ore tested was from the May Day mine, of Eureka, Utah, and was numbered May Day No. 2. An analysis is shown in Table 3 (p. 21). This ore contained 12.96 per cent CaO and 15.7 per cent Zn, with practically no other acid-soluble constituents, except a small proportion of hydrated iron oxides. It was found that practically no iron went into solution until the zinc and calcium minerals had reacted with the acid. Several series of leaches were made with this ore.

LEACHES WITH WEAK ACID SOLUTIONS.

In the first series successive additions of acid were made in order to leach the zinc in successive fractions. The efficiency of the acid and the percentage extraction of the zinc were determined after each addition of acid had had time to react. In each test the ore had been ground to pass a 150-mesh screen, and was leached for 16 hours to insure complete reaction. The ore and the dilute acid were agitated in small bottles on a roller-agitator designed for laboratory testing.

The results are shown by the curves in figures 18 and 19. The curves indicate that sulphuric acid has a higher efficiency, but the hydrochloric acid gives a higher recovery of the zinc, pound for pound of acid used. As hydrochloric acid has a lower molecular weight than sulphuric acid, a pound of the former should theoretically do more work than a pound of the latter, which is in agreement with the observed results. If the curves for percentage extraction of zinc are

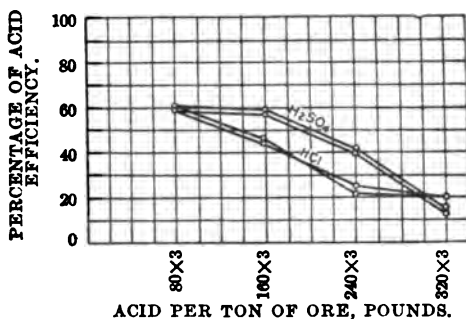


FIGURE 18.—Curves showing efficiency of weak acids in four successive leaches.

plotted with moles (molecular weights) of acid in place of pounds of acid per ton of ore, it is found that the work done by the two acids is identical—that one molecule of hydrochloric acid does exactly the same amount of chemical work in leaching zinc as does one molecule of sulphuric acid. (See fig. 20). Hence, chemically, the two

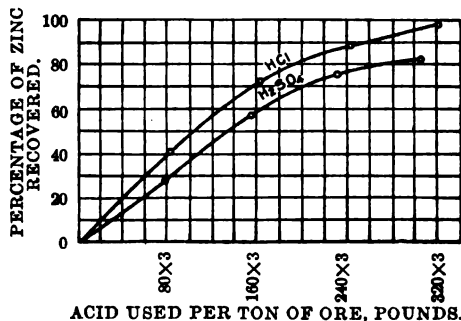


FIGURE 19.—Curves showing recovery of zinc in four successive leaches with weak acids (80 pounds of acid per ton of heads used in each leach).

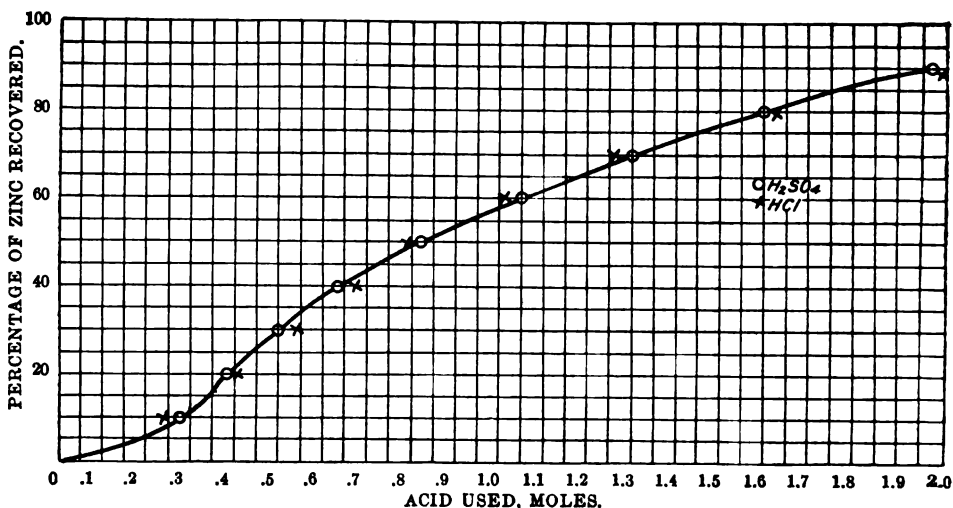


FIGURE 20.—Curve showing relation of zinc recovery to molecular weights of acid used.

acids are equally efficient as regards the percentage recovery of the zinc.

LEACHES WITH INCREASING STRENGTHS OF ACID SOLUTION.

In addition to the series of leaches with successive amounts of weak acid, a series of leaches were made with the same weights of acid but with increasing concentrations, in order that an idea might be obtained as to the effect of different concentrations of acid on the leaching of the zinc and on the acid efficiency of the two acids. The results are plotted in figures 21 and 22, which also show similar curves for the first series. Comparison of these curves show that absolutely no difference in chemical effect is produced by the use of acid in various concentrations.

In other words, a definite quantity of acid, when applied to a certain weight of ore and permitted sufficient time to react, will leach out a certain amount of zinc with a certain definite efficiency of the acid, whatever the concentration of the acid solution.

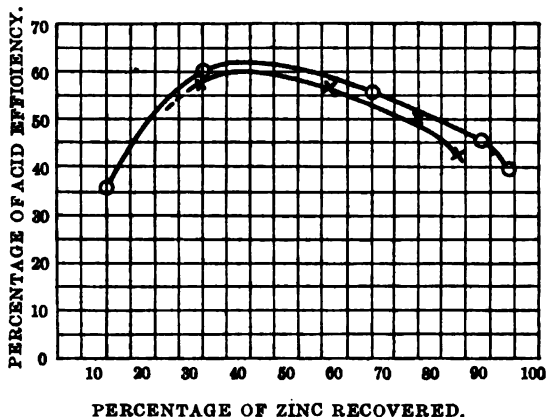


FIGURE 21.—Curves showing effect of different concentrations of sulphuric acid: X, successive leaches with weak acid; O, leaches with different strengths of acid solution.

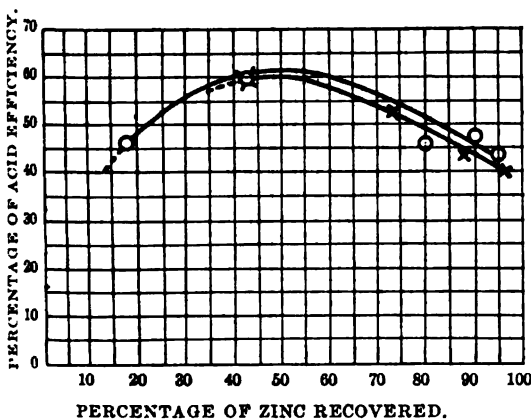


FIGURE 22.—Curves showing effects of different concentrations of hydrochloric acid: X, successive leaches with weak acid; O, leaches with different strengths of acid solution.

Curves for computing the acid efficiencies of sulphuric and hydrochloric acids when the number of pounds of zinc leached from a sample of ore and the number of pounds of acid consumed are known, are presented in figure 23. These curves can likewise be used in

These results are of fundamental importance, because they show that any convenient concentration of acid may be used, the exact concentration being entirely determined by mechanical considerations in designing the leaching plant. Subsequent work on a large variety of ores verified this result, so that the data need not be presented.

interpreting the results of some of the tests described in the following pages, when the acid efficiencies are stated, for finding the weight of acid necessary to recover a pound of zinc from the ore in question.

LEACHING AGENTS.

SULPHURIC ACID.

As the foregoing tests had indicated that the strength of acid solution used had no effect either on the acid efficiency or on the percentage of zinc recovered, further tests were made of a wide

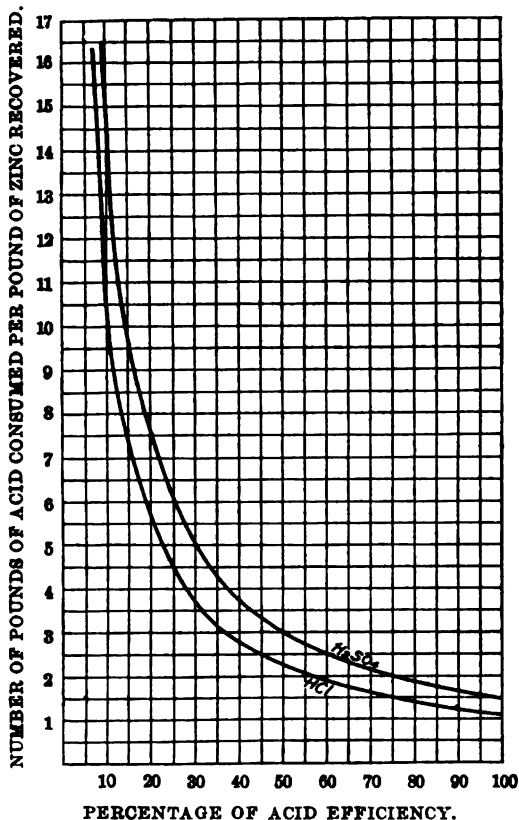


FIGURE 23.—Curves for computing acid efficiency when weights of acids consumed and zinc recovered are known.

variety of oxidized zinc ores in order to confirm these conclusions and to study the various impurities that might be found in the solutions from different ores.

The first series of leaches was with samples representing different types of oxidized ores of zinc from various mining districts. The composition and the screen analysis of each of these samples are shown in Table 41, following:

TABLE 41.—*Compositions of oxidized zinc ores used in leaching tests with sulphuric acid.*

	Scranton No. 1.	Scranton No. 2.	Scranton No. 3.	Lower Mammoth No. 1.	Lower Mammoth No. 2.	Lower Mammoth No. 3.	Bullion Coalition No. 13.	Western Mining Co.	Santaquin King mine.	Iake View No. 103.	May Day No. 4.
Insoluble.....per cent.	14.0	10.6	8.5	54.6	59.6	19.2	17.0	19.5	33.9	14.0	25.0
CaO.....do.	13.1	8.2	12.4	2.9	.9	2.1	4.2	Trace.	.6	19.5	12.2
Fe.....do.	7.5	33.0	18.5	10.5	4.79	27.0	18.5	19.7	.3	.8	2.6
Al ₂ O ₃.....do.	11.3	3.3	2.6	2.3	4.48	12.1	6.1	3.3	Trace.	1.5	.....
MgO.....do.	1.5	4.7	1.1	1.4	.4	2.1	1.5	do.	Trace.	3.9	.....
Zn.....do.	25.0	8.9	18.7	9.1	12.3	11.8	28.3	20.1	45.5	34.3	21.6
Pb.....do.	.3	1.4	.5	1.2	.3	2.2	.3	.05	Trace.	1.4	11.7
Cu.....do.	Trace.	Trace.	Trace.	Trace.	Trace.	.99	Trace.	do.	do.	Trace.	Trace.
Ag.....ounces	.45	.28	.16	1.8	.3	4.3	.....	.....	.....	.....	.....
S.....per cent.	.3	.35	.5	4.8	1.04	.9	.4	.....	.....	.....	.36
CO ₂.....do.	16.8	15.5	17.6	3.6	8.5	6.1	11.9	.....	.....	.....	17.1
Mn.....do.	.04	.05	.19	.53	.27	.72	.63	.....	.....	.03	1.07

SCREEN ANALYSIS IN CUMULATIVE PERCENTAGES.

Mesh.											
+28.....	8.5	6.9	11.4	14.3	12.0	10.5	2.6	11.2	(a)	8.6	11.4
35.....	20.8	20.2	25.6	22.8	22.1	22.8	7.1	26.1	(a)	26.7	27.8
48.....	32.9	41.8	37.9	28.8	30.4	34.4	15.3	36.9	(a)	38.4	40.4
65.....	43.5	52.0	47.3	33.2	36.3	44.2	28.2	47.2	(a)	49.8	50.1
100.....	56.2	65.7	58.1	39.2	43.0	57.1	39.9	57.9	(a)	61.0	61.4
150.....	63.2	72.8	64.1	43.2	47.8	66.7	47.4	63.8	(a)	69.4	69.1
200.....	74.2	84.7	73.8	46.8	51.7	74.3	74.6	74.2	(a)	73.0	74.1
	100	100	100	100	100	100	100	100	(a)	100	100

(a) All passed 60 mesh.

Most of these ores were tested with dilute acetic acid to dissolve zinc carbonate and with dilute sulphuric acid to dissolve zinc carbonate and zinc silicate. The results of the tests, shown in Table 42, give a rough idea of the total percentage of oxidized zinc present as carbonate.

TABLE 42.—*Results of trial leaches on 1-gram samples of oxidized ores.*

[Samples ground to pass through 100-mesh sieve.]

Mine and sample.	Percentage of zinc recovered by leaching for—		
	20 minutes in hot acetic acid.	30 minutes in hot sulphuric acid solution, 10 per cent strength.	90 minutes in cold sulphuric acid solution, 10 per cent strength.
Scranton, No. 1.....	61.5	95.1	90.0
Scranton, No. 2.....	69.7	96.0	89.0
Scranton, No. 3.....	64.3	94.0	85.7
Lower Mammoth, No. 1.....	49.7	80.5	56.8
Lower Mammoth, No. 2.....	67.4	94.0	75.6
Lower Mammoth, No. 3.....	72.5	87.3	93.0
May Day, No. 4.....	89.8	97.0	91.2
Bullion Coalition.....	84.5	93.5	95.5

The ores were then tested for acid consumption and zinc recovery by treating 100-gram lots, ground to pass a 20-mesh sieve, in sulphuric acid solutions of about 10 per cent strength. The ore and solution was placed in 2.5-liter acid bottles and agitated on a set of agitating rolls. The principal results of each set of tests are reported in Table 43 following. Most of the zinc can be removed from the average oxidized zinc ore by the use of sulphuric acid solutions, but the efficiency of the acid used in leaching varies greatly for different ores, being naturally dependent on the amounts of lime, magnesia, and other acid-consuming constituents of the ore.

TABLE 43.—*Results of leaching oxidized zinc ores with sulphuric acid, showing zinc recovery and acid efficiency.*

[100-gram sample, ground to pass 20-mesh sieve, used in each test.]

Mine and sample.	Time, hours.	Equivalents of acid supplied.	Percentage of acid efficiency.	Percentage of zinc recovered.	Mine and sample.	Time, hours.	Equivalents of acid supplied.	Percentage of acid efficiency.	Percentage of zinc recovered.
Scranton, No. 1.....	1.5	1.0	53	53	Lower Mammoth, No. 2..	1.5	1.5	82	75
	1.5	1.5	80	90		1.5	3.1	80	75
	1.5	2.0	80	95		1.5	4.3	80	77
	3.0	1.0	81	92		3.0	3.1	82	77
	3.0	1.5	81	91		3.0	4.3	81	75
	3.0	2.0	59	90	Lower Mammoth, No. 3..	1.5	1.5	53	80
Scranton, No. 2.....	1.5	1.5	45	87		1.5	3.5	52	84
	1.5	2.36	35	81		1.5	4.7	52	82
	1.5	4.45	36	80		3.0	3.5	48	84
	3.0	2.36	34	81		3.0	4.7	48	84
	3.0	4.45	34	82	Santaquin King.....	1.5	1.0	82.5	79
Scranton, No. 3.....	1.5	0.89	54	54		1.5	1.25	81.0	88
	1.5	1.0	41	84		1.5	1.8	82	90
	1.5	1.3	45	87		3.0	1.25	83	94
	3.0	1.0	43	87		3.0	1.8	94	98
	3.0	1.3	46	89	Lake View, No. 105.....	1.5	1.0	80	75
Bullion Coalition, No. 15.	1.5	1.0	85	85		1.5	1.5	87	98
	1.5	1.5	80	92		1.5	2.4	80	97
	1.5	2.0	80	93		3.0	1.5	66	97
	3.0	1.5	78	92		3.0	2.4	60	98
	3.0	2.0	79	93	Western Mining Co.....	1.5	1.0	72	80
May Day, No. 4.....	1.5	1.0	86	66		1.5	1.25	80	90
	1.5	1.5	63	86		1.5	2.5	85	91
	1.5	2.0	67	90		3.0	1.25	84	92
	3.0	1.5	64	92		3.0	2.5	86	92
	3.0	2.0	68	90					
Lower Mammoth, No. 1.	1.5	1.0	83	52					
	1.5	3.1	85	52					
	1.5	4.6	85	52					
	3.0	3.1	85	52					
	3.0	4.6	85	52					

Such tests are of fundamental importance in determining whether enough zinc can be recovered from a definite ore and whether the consumption of acid will be excessive, but an even more important point is the properties of the solutions made, because the purity of the finished product depends on the character of the solutions. As the modern methods of purifying zinc sulphate solutions depend upon reducing the solution to a neutral condition, analysis of the

solutions from such ores, when only sufficient acid is used to dissolve the zinc and to leave the solution neutral, is of prime importance. On that account, a sample of each of the ores was leached with sulphuric acid solution of 10 per cent strength for $1\frac{1}{2}$ hours. Then enough concentrated acid was added to bring the acidity back to 10 per cent, and the solution was passed over fresh ore until no free acid remained. The analyses of the resulting solutions are shown in Table 44. In almost every test it was noted that when the pulp was neutral there was some difficulty in filtering the solution. Neutral solutions from Scranton No. 2 and No. 3 ores were almost impossible to filter and finally set as gels, on account of the high percentage of silicic acid present in them. Some of the gel that formed in one test was washed and dried, and gave the following analysis: Zn, 2 per cent; Fe, 2 per cent; CaO, 0.7 per cent, and SiO_2 , 93.6 per cent.

TABLE 44.—Results of analyses of neutral solution of zinc sulphate and impurities.

Mine and sample.	Zn.	SiO_2 .	CaO.	MgO.	Al_2O_3 .	Fe.	Mn.	Zn in tailing.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Scranton, No. 1.....	9.3	0.46	0.28	0.72	0.01	0.03	.....	1.4
Scranton, No. 2.....	6.2	2.05	.23	1.2	.....	.07	.....	1.7
Scranton, No. 3.....	7.0	2.2	.20	.75	.....	.02	0.008	1.5
Bullion Coalition, No. 13.....	12.7	1.76	.27	.20	.....	.07	.0008	3.7
Lower Mammoth, No. 1.....	8.75	.07	.16	.34	.22	.40	.....	4.4
Lower Mammoth, No. 2.....	8.20	.39	.24	.22	.19	.17	.003	4.1
Lower Mammoth, No. 3.....	8.0	.22	.19	.26	.90	.08	.....	2.6
May Day, No. 4.....	9.75	.14	.19	.26	.....	.02	.015	1.7
Santaquin King.....	12.6	.33	.2	tr.	.27	.02	.....	1.6
Western Mining.....	14.4	.51	.1	tr.	.53	.08	.....	2.0
Lake View, No. 105.....	14.5	.51	.2	tr.	.52	.08	.....	.6

As it was thought probable that electrolytic recovery of the zinc from such solutions might be attempted in some instances, the effects of silicic acid gel were further investigated. It was found that silicic acid caused serious trouble only when the solutions were neutral, and that the acid solutions were much more easily filtered. Many of the pulps, when allowed to stand over-night in the neutral condition could not be filtered the next morning and in many cases the whole solution has set to a gel. The lowest percentage of silica ever observed in one of these gels was 0.6 per cent and this gel took about two days to set. Electrolytic precipitation of the zinc would not remove the silica from the solutions, therefore the silica would tend to build up. The analyses of the solutions indicated that with continued use the silicic acid would soon build up to a point where it would entirely prevent further operation. Cyclic leaching of a number of the ores tested proved that the silica had such an effect. As a rule when the silica content of the solution reached more than 2 per cent, filtering became very

difficult and could be done only when the neutral liquor was acidified and used for treating fresh ore without removal of the zinc.

As is shown subsequently, removal of this colloidal silica from solutions contaminated with it was almost impossible. Therefore, in treating oxidized zinc ores containing silica, the preparation of zinc sulphate solutions in such a way that the silica would not be present is necessary. Silicic acid can be desiccated to form "insoluble silica" and water by heating it to more than 125°C . in the open air. Consequently, an attempt was made to prepare a solution free of silicic acid by treating the ore with just enough strong sulphuric acid to moisten it, heating the mixture of sulphuric acid and ore to about 150°C ., or higher, and leaching the calcined material with water.

It was found that concentrated sulphuric acid would not moisten the ore sufficiently, so the necessary acid for converting the zinc into zinc sulphate was added as a 50 per cent solution, with satisfactory results. The laboratory roasts were made in roasting dishes in a gas muffle furnace. A large proportion of the iron and the alumina are converted into the corresponding sulphates by this treatment, unless the temperature of the roast is maintained at about 600°C . or higher. Iron sulphate breaks up rather slowly at 600°C ., requiring at least two hours' roasting to prevent the subsequent appearance of iron in the solutions. At 700°C . the necessary time for obtaining the same result varies from one-half to one hour. At 800°C . some of the zinc sulphate is broken up by the heat, and as a result leaching with water does not obtain as much zinc. The zinc sulphate formed tends to cake the material together, and in most furnaces this caking would probably cause mechanical difficulty in handling such material. Possibly some type of horizontal kiln would be necessary in order to avoid trouble from this source.

Practically all the oxidized ores tested yielded to this treatment, the zinc recoveries being about the same as those obtained by direct leaching with solutions of sulphuric acid, except that when a charge was overheated some of the zinc sulphate was broken down into zinc oxide or into basic zinc sulphate. Under these conditions sulphuric acid had to be added to the leaching water in order to get good recoveries. In almost every test it was necessary to use enough sulphuric acid to satisfy all the zinc, lead, lime, and magnesia in the ore before satisfactory recovery of the zinc could be made. The amounts of iron usually entering the solution varied from 10 to 20 milligrams per liter. Manganese was not so easy to keep out of the solution, because its sulphate does not seem to decompose as easily as that of iron. Consequently there was usually a considerable amount of manganese in the solutions prepared from these ores. Silica was rarely present in more than traces.

The disadvantage of getting the zinc into solution in this manner is that only strong solutions of sulphuric acid can be used, whereas electrolytic precipitation of a zinc sulphate solution would regenerate only a weak solution of sulphuric acid which could not be used for sulphating the ore. Consequently this method of preparing pure solutions involves chemical precipitation of the zinc from the solution and loss of the sulphuric acid. Such a procedure would naturally be limited to localities where sulphuric acid was cheaply available in large amounts.

Niter cake, the impure bisulphate of sodium (NaHSO_4), which is usually available as a waste product from nitric acid plants, powder plants, sulphuric acid plants, etc., has an available acidity of about 30 per cent in the usual commercial article, and melts at a low temperature. Niter cake was tried as a substitute for sulphuric acid in sulphating ores at high temperatures. The efficiency in recovering zinc was about the same as with sulphuric acid, but the sodium and zinc sulphates resulting caked the ore harder than when only sulphuric acid was used. Furthermore, with some ores the amount of niter cake necessary to satisfy the acid requirements of the ore was excessive, and the resulting burden of sodium sulphate in the water leaches made recovery of the zinc from the solution doubtful. Therefore, sodium sulphate is an undesirable diluent of the acid used in preparing the ore.

HYDROCHLORIC ACID.

The preceding considerations of the adaptability of sulphating at a high temperature followed by chemical precipitation for recovering zinc recalls the fact that no acceptable method of precipitating zinc from its sulphate solutions by any commercially available chemicals has been devised. Lime is the cheapest base available, but it forms calcium sulphate which will mix with the zinc hydroxide precipitate. Hence the preparation of chloride solutions of zinc is desirable, if this can be done, because they would be better adapted to precipitation by lime. As was shown in an earlier part of this paper, hydrochloric acid is equally efficient with sulphuric acid, by molecular weights, in dissolving zinc from its oxidized ores, and wherever cheaply available could easily be used for leaching such ores. The station has contemplated making some experiments on the preparation of hydrochloric acid by the interaction of sodium chloride with silica and steam at high temperatures. The reaction is known to take place, but development work needs to be done on the mechanical application of the reactions. If hydrochloric acid can be prepared cheaply in this way, application to the leaching of zinc ores will then be easy.

SULPHUROUS ACID.

The use of sulphur dioxide as a leaching agent has always appealed to the hydrometallurgist, but to date there have been practically no successful commercial installations of sulphurous-acid leaching plants for either zinc or copper ores. Many attempts have been made to absorb sulphur dioxide with water or steam and use the resulting sulphurous acid for leaching either oxidized zinc or copper minerals, but the mechanical difficulties of applying the process have caused all such enterprises to fail. The asphyxiating character of the fumes rising from the solutions necessitate the use of closed vessels, whereas difficulties from reprecipitation and crystallization of salts in pipes and other closed vessels have made it almost necessary to work with open vessels. Furthermore, some of the proposed methods have looked toward recovery of the sulphur dioxide from the sulphite solutions, whereas practice has proved that much of the zinc sulphite is oxidized to higher oxides, from which it was impossible to recover sulphur dioxide.

In most of the intermountain districts the recovery of sulphur dioxide is not vitally necessary, and any satisfactory method for the leaching of the zinc or the copper and the ultimate wasting of the sulphur dioxide would usually be acceptable. On that account further investigation of the possibility of sulphurous acid leaching of oxidized zinc ores was deemed advisable.

The first factor determined was the approximate solubility of zinc bisulphite, the soluble compound of zinc formed by the use of excess of sulphurous acid. The monosulphite of zinc is insoluble, and most of the proposed processes for sulphurous acid leaching involve leaching of the zinc as a bisulphite solution with subsequent precipitation of insoluble zinc monosulphite. By suspending an excess of zinc oxide in water and then passing sulphur dioxide from a cylinder of the liquified gas until the solution smelled strongly of excess sulphur dioxide, it was found that at the ordinary temperature of the laboratory 6.97 per cent of zinc was in solution and the total sulphites present were equivalent to 16.08 per cent SO_2 . Thus about 2.36 per cent of SO_2 was uncombined. Most of the values in the literature on the subject for solubility of zinc sulphite agree reasonably well with these figures, although in some patent specifications mention is made that some of the zinc often oxidizes to the sulphate form, when the total zinc content of the sulphite leaching solution can approach 10 per cent.

A number of tests were made with several ores, to determine the leaching efficiency of sulphurous acid as compared with sulphuric acid. The results of these leaches are given in Table 45. The zinc recoveries, even with very dilute solutions, are fully as good as those

possible with sulphuric acid solutions. The acid efficiency obtainable is likewise comparable with the acid efficiency of the sulphuric acid solutions. The figures in the column for acid efficiency represent the apparent efficiency, which is twice the actual efficiency, because in titrating the leach solution for acidity the zinc bisulphite reacts with the acid until completely neutralized, forming zinc monosulphite. Hence the figures in the column of acid efficiencies should be divided by two.

TABLE 45.—*Results of sulphurous acid leaching of oxidized zinc ores.*

Mine and sample.	Leach No.	Weight of ore.	Weight of SO ₂ .	SO ₂ per 100 c. c. of water.	Volume of solution.	Zinc per gram of SO ₂ .	Percentage of acid efficiency.	Percentage of zinc recovered.
		<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>C. C.</i>	<i>Grams.</i>		
Bullion Coalition, 12....	1	6.29	3.35	0.167	2,000	0.973	192.0	96.1
	2	6.29	3.35	.335	1,000	.854	168.0	96.1
	3	6.29	3.35	.670	500	.830	162.0	97.1
	4	6.29	3.35	1.34	250	.912	187.0	92.8
	5	6.29	3.35	2.00	167	.694	137.0	91.0
	6	6.29	6.70	2.68	250	.934	180.0	97.9
Scranton, 1.....	1	6.36	5.00	.25	2,000	.779	192.5	95.2
	2	6.36	5.00	.50	1,000	.940	185.0	94.0
	3	6.36	5.00	1.00	500	.866	168.0	96.2
	4	6.36	5.00	2.00	250	.865	176.5	97.0
	5	6.36	5.00	3.00	167	.624	122.7	92.8

The impurities taken into solution by sulphite solutions are lime, alumina, iron, copper, and small amounts of silica. Lead, silver, and gold do not dissolve to any extent.

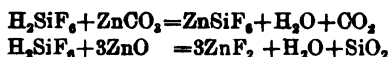
The mechanical requirements for successful leaching of zinc ores by the bisulphite method have already been considered in the part of this bulletin dealing with the hydrometallurgy of the sulphide ores (pp. 81-84). Except for the tendency of silicic acid to enter the solutions in the leaching of oxidized ores and later contaminate the precipitate of zinc monosulphite, there is little difference between the problem of the treatment of oxidized and of sulphide ores by sulphurous acid. As the zinc bisulphite solutions must be acid for filtering, no filtration difficulty is experienced, whereas zinc sulphate solutions are usually filtered in the neutral condition where the silicic acid causes trouble.

HYDROFLUOSILICIC ACID.

As the writers had been informed that zinc fluosilicate solutions could be easily electrolyzed to give good cathode spelter, a few hydrofluosilicic acid leaches of oxidized zinc ores were tried in order to see whether the acid would be an acceptable leaching agent. Leaching the raw ore with hydrofluosilicic acid gave an acid efficiency of more than 100 per cent. The theoretical weight of acid which should be consumed is 2.2 pounds per pound of zinc, whereas the observed consumption was only 1.9 pounds. This lower rate was attributed to the presence of some hydrofluoric acid in the hydrofluosilicic acid,

which, on account of the lower molecular weight of the former, would make the hydrofluosilicic acid appear more than 100 per cent efficient.

On leaching part of the same sample of ore with the acid after calcination, the acid consumption amounted to only 0.52 pound per pound of zinc. On the assumption that the zinc oxide from the roasting caused hydrolysis of the hydrofluosilicic acid with resultant formation of zinc fluoride, in place of zinc fluosilicate, only 0.615 pound of the acid would be required to leach 1 pound of zinc. Thus, the results would seem to indicate that the following reactions took place in the two tests:



This shows that hydrofluosilicic acid might be used for the leaching of zinc carbonate ores, but that it would be unsuitable for the treatment of any type of roasted products. No further work was done with it.

ALKALINE AGENTS.

The fact that zinc oxide and zinc carbonate will combine with solutions of caustic soda or of ammonia to form zincates is the basis of many proposed processes for leaching oxidized zinc ores. In many instances these processes would have an especial advantage over acid leaching, because most of the oxidized zinc ores contain important amounts of calcium and magnesium carbonates, and other acid consuming minerals which would not affect the alkaline leaching agents. Hence much better chemical efficiency of the leaching agent should be possible. With this in mind, two leaching agents were tested—caustic soda solutions and ammoniacal solutions.

CAUSTIC SODA.

Caustic soda, as a solvent for zinc ores, has been proposed by many inventors, but has never been applied commercially with any success.* The available literature gives little information as to the causes for the failure of caustic soda as a leaching agent. However, the writers soon found that, although many patents claim the application of caustic soda solutions to oxidized ores, satisfactory recoveries of the zinc from these ores by the use of solutions containing 10 to 25 per cent NaOH was almost impossible.

The results of six leaches of the May Day No. 2 ore with caustic soda solutions are recorded in Table 46. In each of these leaches

* A list of the principal United States patents covering the use of caustic soda leaching solutions is as follows: Ketchum, E. C., No. 592055, Nov. 21, 1896; Ryan, Thomas, Jr., and Hughes, Newton, No. 647989, Dec. 26, 1899; Strzoda, Wilhelm, No. 656306, Jan. 20, 1899; Sedtler, S. S., No. 700563, July 10, 1900; Barton, Thomas, and McGlue, T. B., 689,275, July 30, 1901; Ranson, Charles, No. 1023964, July 8, 1910; Bretherton, S. E., No. 1204843, Dec. 22, 1912; Asef, Waldemar, No. 1165743, Oct. 26, 1914; Snyder, E. H., No. 1184585, Mar. 31, 1915.

33.3 grams of ore ground to pass an 80-mesh sieve was agitated in 100 cc. of a 22.44 per cent NaOH solution. With cold solutions the recovery was very low. Even with hot solutions only about two-thirds of the zinc was obtained and the solution had to be maintained at 97°C. for four hours for this result. The zinc oxide is supposed to be precipitated from the solution on dilution, hence enough water was added to make 1,000 cc., which, of course, reduced the strength of the solution to about 2 per cent. Under these conditions a precipitate of zinc hydroxide was obtained containing about 40 per cent of the zinc originally in the ore, as shown by the last column in Table 46. The remainder of the zinc stayed in solution.

TABLE 46.—Results of leaching oxidized zinc ore with caustic soda solution.

Test.	Temp- erature.	Time.	Telling.		Zinc recovery.	Zinc per 100 c. c. of solution.	Zinc recovered on dilu- tion.
			Weight.	Zinc content.			
	* C.	Hrs.	Grams.	P. ct.	P. ct.	Grams.	P. ct.
1	97	1	26.42	7.4	62.5	3.26	34.5
2	97	2	26.14	7.3	63.5	3.38	41.5
3	97	3	26.01	7.0	65.2	3.47	39.0
4	97	4	25.72	7.7	62.2	3.44	40.7
5	20	20	29.25	11.1	37.8	1.93	-----
6	20	7	30.02	12.5	28.2	1.53	-----

On account of the difficulty of dissolving the zinc, to say nothing of the practical difficulties involved in dilution of the solution followed by evaporation in order to recover the sodium hydroxide, no further work was done with this process.

The consumption of alkali, determined in each of the tests shown in Table 46, was about 80 to 100 pounds of sodium hydroxide per ton of ore. The sodium is supposedly fixed as sulphate or chloride, or possibly even as silicate, but the results had been so discouraging that this latter point was not determined.

AMMONIA.

Ammoniacal leaching solutions have received much more favorable consideration than caustic soda from metallurgists in times past, although no commercial plants using such solutions have been built.*

Most of the methods proposed for leaching zinc ores with ammonia involve the use of ammoniacal ammonium-carbonate solutions, because carbon dioxide tends to accumulate in the solutions as ammonium carbonate, and also because the presence of combined

* United States patents relating to ammoniacal leaching of zinc ores are as follows: Burghardt, C. A., and Rigg, Gilbert, 585355, June 1, 1896; Koshler, W. J., 611917, Nov. 7, 1896; Howard, Henry, 623154, May 14, 1898; Rigg, Gilbert, 654804, May 6, 1899; Hirsching, Henry, 735512, Mar. 19, 1902; Bermont, Victor, 751712, May 6, 1902; Joseph, T. B., 780293, May 18, 1904.

carbon dioxide seemingly does not impair the solubility of the zinc oxide and other oxidized compounds of zinc. Ammonium zincate is a compound which is often assumed to result from the reaction of the solutions on the zinc minerals. Whether the zinc oxide actually combines with the ammonia, or whether it is merely dispersed and taken into colloidal solution, is immaterial, as long as the zinc can be dissolved.

A lengthy series of tests with solutions of ammonia and solutions of ammoniacal ammonium sulphite was made in the effort to determine under just what conditions the zinc could be most easily leached. It was found that the solutions containing ammoniacal ammonium sulphite would dissolve twice as much zinc from the ore as the ammonia solutions. A solution containing about 5 per cent free NH_3 and about 3 per cent $(\text{NH}_4)_2\text{SO}_3$ gave as good recoveries as stronger solutions. The amount of zinc recovered was, then, roughly proportional to the free ammonia present, being about 0.29 gram of zinc per gram of free NH_3 . This latter ratio shows that 14 molecules of NH_3 are required to extract 1 atom of zn. Such leaching solutions dissolved slightly more zinc than would dilute acetic acid, when applied to the leaching of an oxidized zinc ore. Evidently the ammoniacal solutions attack only the zinc carbonate, leaving the zinc silicate minerals almost unaffected. On leaching a roasted sphalerite ore it was found that all the zinc oxide, zinc sulphate, and zinc sulphite were dissolved. Zinc sulphide and zinc ferrate were seemingly unaffected.

The large amount of ammonia necessary to dissolve the zinc makes such a process of doubtful value, because either the proportion of leaching solution to ore must be large or else strong solutions of ammonia must be used, in which event only about a 5 per cent solution of zinc can be prepared. Neither of these conditions is desirable.

Therefore, the conclusion may be made that ammoniacal leaching solutions are not adapted to complete recovery of zinc from either roasted sulphide ores or oxidized zinc ores, except certain sulphide ores that can be roasted without the formation of ferrites, or oxide ores that contain no zinc silicate. In any event the mechanical difficulties in handling the leaching solutions are serious.

PURIFICATION AND PRECIPITATION OF SOLUTIONS.

The solutions of zinc prepared from oxidized ores by various leaching processes will not differ greatly from those prepared from the sulphide ores, except in a few particulars. As a rule, a greater proportion of impurities will be taken up from the oxidized ores, hence the solutions will require more careful purification.

Silicic acid was the most prominent impurity noted in the work with oxidized ores. Acid leaching solutions attack the zinc silicate, which is almost invariably present in the oxidized ores, forming silicic acid which tended to set to a gel as soon as the solutions became neutral. As most of the iron, alumina, and arsenic are removed from the zinc sulphate or zinc chloride solutions while in neutral condition, this formation of silicic acid introduced a serious difficulty. Attempts to precipitate the silicic acid by the use of zinc oxide, lime, and glue, resulted in a light fluffy precipitate suspended in the solution which was difficult to filter and retained too much zinc. No satisfactory method of purifying the solution of silicic acid could be found. This resulted in the adoption of methods of ore treatment that would convert the zinc to a soluble form while breaking up the silicic acid by desiccation.

Limonite and similar compounds in oxidized zinc ores are readily attacked by sulphuric acid solutions, with the result that much iron is dissolved and must be removed before either satisfactory electrolytic or chemical precipitation can take place. The removal of iron from such solutions, however, is not difficult and has been discussed sufficiently in the part of this bulletin on the hydrometallurgy of zinc sulphide ore. The same statement applies to the manganese in these ores.

The precipitation of the various leaching solutions has been hinted at during the discussion of the leaching. Precipitation of these solutions is no different from the precipitation of the solutions prepared from sulphide ores, hence need not be discussed at this point except where the treatment of oxidized ores may introduce some new factor not previously mentioned.

There are no commercial plants in operation at present for treating oxidized zinc ores by leaching and precipitation. As sulphuric acid is practically the only leaching agent used in the United States, and electrolytic precipitation is the only method in common use, seemingly some plant for treating oxidized zinc ores by a combination of these methods would have been established if the method were feasible. The writer's experience in leaching raw oxidized zinc ores has been that the difficulty of removing the silicic acid makes purification of the solutions for satisfactory electrolytic precipitation impossible. The only feasible course was to treat the ore with strong sulphuric acid solutions, and heat it to about 600° C. in order to break up silicic acid, iron sulphates, and similar undesirable impurities. The leaching of this product with water would give a good zinc sulphate solution, but after electrolytic precipitation the dilute sulphuric acid solution, containing some zinc sulphate, would not be sufficiently concentrated to treat the ore for the first

step of the process. Hence sulphuric acid leaching and electrolytic precipitation do not seem to be adaptable to oxidized zinc ores.

If the ores are treated with sulphuric acid without electrolytic precipitation and recovery of the solvent, there may be a possibility of leaching such ores. This necessarily involves chemical precipitation of the zinc sulphate solutions. The lime precipitation method, in which the zinc sulphate solution is converted into zinc chloride solution, has been described under the discussion of sulphide ores. Also, sodium hydrate or carbonate might be used as precipitants, except that the precipitate is rather difficult to settle and the cost of such reagents would usually be excessive. The use of ammonia as a precipitant for zinc sulphate solutions may have some possibilities as the ammonia could later be distilled from the precipitated solutions after adding an excess of lime to them. This method has not yet been tested by us but will later receive attention. The most doubtful point is the percentage of ammonia that would be recoverable for reuse.

The precipitation of bisulphite solutions of zinc has likewise been discussed under sulphide ores, and as regards precipitation the necessary considerations are well outlined in that part of this bulletin. With oxidized zinc ores the solutions contain greater percentages of iron and similar impurities, and the purification of sulphite solutions containing these is not well understood; more work is necessary before definite conclusions can be drawn.

A few tests were made with the precipitation of the leaching solutions obtained by treating an oxidized zinc ore with strong caustic soda. The results of these tests are given in connection with the data on leaching in Table 46 (p. 133). Dilution of the leaching solution to ten times its original volume still left about one-third of the zinc in the solution, whereas the other two-thirds was precipitated as zinc hydroxide through hydrolysis of the sodium zincate solution. Obviously the dilution of a solution to this extent would make the expense of evaporating the precipitated solution, in order to obtain the caustic soda for reuse, too high.

Zinc can be precipitated from sodium zincate solutions by electrolysis as sponge zinc. This sponge can be dried in the open air over a hot plate without danger of much oxidation and has a high silver precipitation efficiency for cyanide solution when used as zinc dust.^a If all the details could be worked out with respect to filtration of the solutions and recovery of the caustic soda from the wash water, this fact could easily be made the basis of a process for the preparation of zinc dust which would be of high efficiency and hence of special value for cyanide plants.

^a Morgan, H. J., and Ralston, O. C., Electrolytic zinc dust: *Trans. Am. Electrochem. Soc.*, vol. 30, Sept. 30, 1916, pp. 231-241.

Ammoniacal solutions of zinc would have to be boiled to remove the ammonia and precipitate the zinc. The cost of fuel might easily be excessive, as the leaching solutions would probably not contain more than 2 per cent of zinc, necessitating the boiling of large quantities of solution. In order to save fuel expensive heat exchangers would be necessary, and the troubles of operating such a plant might easily condemn the process. The use of ammoniacal solutions for leaching oxidized copper ores is now meeting with some favor, but it must be remembered that a pound of zinc requires the use of more ammonia than a pound of copper and is worth only a third as much. Careful engineering would be necessary to overcome the disparity between the two metals.

SUMMARY OF HYDROMETALLURGY OF OXIDIZED ZINC ORES.

Serious, although not insuperable, difficulties are to be met in the leaching of most oxidized zinc ores by either acid or basic solvents. Nearly all such ores contain rather large amounts of acid-consuming minerals other than the zinc minerals. Leaching with sulphuric acid is difficult, on account of the tendency for the silicic acid formed to jelly when the solution approaches the neutral condition during purification. This makes necessary the "fuming" of the ore with sulphuric acid in order to break up the silicic acid. Sulphurous acid leaching is also difficult, as the solutions must be filtered from the ore while acid and hence carry large amounts of impurities; also, the purification of such solutions is still to be accomplished. Caustic soda and ammoniacal solutions do not seem to attack the zinc silicates, which are present in almost every oxidized ore of zinc, and precipitation of both solutions promises to be difficult, or at least expensive.

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INDEX.

A.		C.	
	Page.		Page.
Arctic acid, hot, leaching with, tests of, results of.....	125	Calcining oxidized zinc ores, tests of.....	105
leaching with.....	59	results of.....	106
results of, curves showing.....	58	Calcium chloride, as precipitant, tests of.....	90-91
Acid, molecular weight of, relation of to zinc recovery, curves showing.....	122	results of.....	90
weak, leaching efficiency of, curves showing.....	122	Cameron, F., acknowledgment to.....	38
tests of.....	121-122	Carbonates, zinc, production, United States, 1914.....	12
See also Acetic acid; Hydrochloric acid; Hydrofluosilicic acid; Silicic acid; Sulphuric acid; Sulphurous acid.		Carlyle mine, ores of, magnetic separation of, with tabling, results of.....	49-50
Acid efficiency, curves for computing.....	124	without tabling, results of.....	50
definition of.....	121	Caustic soda, leaching with.....	85, 132-133
in test with oxidized ores.....	126	United States patents, list of.....	132
Alkali solutions, precipitation of zinc in.....	89	tests of, with results of.....	133
Allen, G. L., acknowledgment to.....	38	Cedar Talisman mine, ore of, analysis of.....	21
Ammoniacal solutions, leaching with.....	85, 133-134	Chloride of lime, removal of manganese from zinc sulphate solutions with.....	94-95
United States patents on, list of.....	133	results of.....	94, 95
precipitation of zinc in.....	88-89	Chloride of zinc, lime as precipitant in, tests of removal of lime from zinc hydroxide with.....	91-92
Ammonium acetate, acid leaching with.....	59	Chloridizing roasting, description of.....	53-54
Analyses. See Mines named.		Chlorine gas, action on zinc sulphide of.....	80
Anderson, L. D., cited.....	18	use in precipitation tests of.....	97-98
Arentz, S. S., acknowledgment to.....	103	Chlorine water, oxidation of manganese in precipitation with.....	96
cited.....	13, 18	results of.....	97
B.		Cleveland mine, N. Mex., leaching iron from sulphides at, results of.....	87
Beggs mill, Utah, costs at.....	37	C. O. D. mine, Ariz., ores from, magnetic separation of.....	51
extraction from tailings at.....	36-37	results of.....	51
value of tailings at.....	27	Comet mill, Mont., leaching iron from sulphides at, results of.....	87
Big Four mill, Utah, metal content of tailing at.....	37	Concentration. See Gravity concentration; Hydromechanical concentration; Flotation; Magnetic separation; Igneous concentration.	
value of tailings at.....	27	Consolidated Nevada-Utah mine, Nev., ores from, magnetic separation of.....	47-48
Bingham Mines Co. mine, Utah, ore from, analysis of.....	22	Constitution mine, Idaho, ore from, analysis of.....	22
Bisulphite solutions, recovery of zinc with.....	100-101	results of.....	48
Blast furnace, small, concentration tests in.....	108-110	Copper, production, Park City district, Utah.....	25
results of.....	110	Copper sulphate, use in flotation of sulphides.....	42
zinc loss in.....	18, 19	Creek leasing mills, Moore's mill, costs per day.....	30
See also Furnace.		description of.....	29
Blast furnace smelting, zinc ore, difficulties of.....	110-111	payments and charges of.....	29-30
Brandford, R. H., acknowledgment to.....	106	recovery from tailings by.....	28
Bretherton, S. E., cited.....	85	Cullen, J. F., acknowledgment to.....	53, 79, 106, 120
Brine, acid, leaching with.....	59	Cyclic leaching and precipitation tests.....	97-98
Broadwater mill, assays at.....	36	results of.....	99-100
magnetic separation at.....	49		
results of.....	49	D.	
value of tailings at.....	26	Daly-Judge mill, Utah, costs at.....	32
Bushler, H. A., cited.....	14, 24	flotation process at.....	33-34
Bullion Coalition mine, calcining oxidized ore at, results.....	106	ores treated at.....	32
neutral, zinc sulphate solution from, analysis of.....	127	assays of.....	33
ores of, analyses of.....	21, 22, 104, 125		
leaching tests of, results of.....	66, 67, 125, 126, 131		

	Page.		Page.
Leaching. <i>See also</i> Acetic acid; Hydrochloric acid; Hydrofluosilicic acid; Acidified ammonium acetate; Acidified brine; Sulphuric acid; Sulphurous acid. <i>See also</i> Mills and mines named.		Mary Murphy mine, Colo., ores from, analyses of.....	22
Leaching solutions, precipitation of.....	126	May Day mine, Utah, calcining oxidized ore at, results of.....	106
<i>See also</i> Acids; Caustic alkaline solution; Caustic soda; Ammoniacal solutions.		leaching test at, results of.....	125, 126
Leaching tests. <i>See</i> Mines named.		ores of, analysis of.....	21, 125
Lead, effects of roasting on solubility.		zinc sulphate solution from, neutral, analysis of.....	127
production, Park City district, Utah.....	26	Middle Golconda mine, Ariz., ores from, tests of.....	51-52
<i>See</i> Roasting, effects of solubility on lead and zinc.		Midvale, Utah, leaching iron from sulphides at, results.....	87
Lead smelting, zinc loss in.....	15, 19	zinc-iron middlings, analyses of, results of roasted, leaching of.....	69
tailing loss, Park City district.....	27-28	results of.....	71
Leasing, Creek mills. <i>See</i> Creek leasing mills.		screen analyses of, results of.....	69
Leasing system, in Joplin district, disadvantages of.....	39	Mills. <i>See</i> Beggs mill; Big Four mill; Broadwater mill; Daly-Judge mill; Daly West mill; Frisco mill; Marsh mill; Morning mill; Moores Creek leasing mill; Silver King Coalition mill	
Lime, as precipitant, advantages of.....	90	Mines, furnishing ores, list of.....	21
precipitation of zinc, from chloride solutions.....	91-92	<i>See</i> Carlyle; C. O. D.; Consolidated Nevada-Utah; Greenwood lease; Middle Golconda; Utah-Apax; Waaa.	
from sulphate solutions.....	90	Mining, zinc losses in, causes of.....	13
tests of.....	92-93	Molecular weight of acid, relation to zinc recovery, curve showing.....	122
results of.....	93-94	Monte Christo mine, Nev., ore from, analysis of.....	21
removal of, from zinc hydroxide.....	95-96	Moore, Charles, acknowledgment to.....	28
use in flotation, Midvale, Utah.....	42-43	Morgan, H. J., acknowledgment to.....	38, 88, 106
Limonite, in zinc ores, magnetic separation of.....	108-106	Morning mill, Idaho, ore from, analysis of.....	22
Losses, zinc. <i>See</i> Tailing losses; Mining, zinc losses in.		Mocow mine, Idaho, ore of, analysis of.....	21
Lower Mammoth mine, Utah, calcining oxidized ore at, results of.....	106	N.	
leaching tests at, results of.....	125, 126	Neal, Walter, acknowledgment to.....	53
ores of, analyses of.....	21, 125	Neeld, H. C., acknowledgment to.....	106, 120
zinc sulphate solution from, neutral, analysis of.....	127	Nevada Zinc Co. mine, Nev., ore of, analysis of.....	21
Lyon, D. A., cited.....	12, 13, 53	Niter cake, substitute for sulphuric acid, tests, results of.....	129
M.		North Star mine, Idaho, ore from, analysis of.....	22
McChrystal, A. J., acknowledgment to.....	79, 103	O.	
MacGregor, F. B.....	16, 18	Ophir Hill Consolidated mine, Utah, ores from, analyses of.....	22
Magnetic roasting, principles of.....	79	Oxidation, of manganese, in precipitation...	96
Magnetic separation, disadvantages of.....	45	Oxide, zinc, plant for making. <i>See</i> Zinc oxide plant.	
iron sulphide ores, results of.....	48	Oxide roasting, discussion of.....	54
limonite and zinc ores.....	103	Oxidized zinc ores, analyses of.....	21
Magnetic separation, principles of.....	15	calcining of.....	105-106
roaster for, description of.....	45	concentration of.....	109
tests of.....	46-52	experiments on, outline of.....	23-24
ores used in.....	46	<i>See</i> Calcining; Gravity concentration; Flotation; Igneous concentration, ores treated by; Roasting, oxidized zinc ore.	
zinc-iron sulphide.....	51	Oxidized zinc ores, leaching of.....	125-126
results of.....	52	prices, Utah.....	111, 113
<i>See also</i> Mills and mines named.		curves showing.....	112
Magnetic separator, description of.....	46	variation of value, curves showing.....	113
Manganese, oxidation in precipitation of.....	96	<i>See</i> Leaching, oxidized zinc ores.	
removal from zinc sulphate solutions of. <i>See</i> Chloride of lime, removal of manganese by; Chloride solution, zinc, removal of manganese by; Chlorine water, removal of manganese by; Chlorine gas, removal of manganese by.			
Marmatite. <i>See</i> Waaa mine, ore of			
Marsh mill, Idaho, ore from, analysis of.....	22		

P.	Page.		Page.
Park City district, Utah, early milling practice.....	25	Sims, C. E., acknowledgment to.....	79
mineralization in.....	25	Size of ore, effect of on roasting speed of. <i>See</i>	
mineral recoveries from tailings in.....	26-27	Roasting, speed, effects of size of ore	
mining and milling of complex ores in.....	24-37	on.....	
ore production of.....	25	Slag, oxidized ore, analyses of.....	109
shippers in, list of.....	25	sulphide ore, analyses of.....	110
Preferential flotation, definition of.....	40	Slimes, carbonates, treatment at Silver King	
<i>See also</i> Flotation; Selective flotation.		Coalition mill.....	35
Publications on metallurgy.....	138-140	Slime concentrates, Daly-Judge mill, analyses	
Pulsifer, H. G., cited.....	108	of.....	34
		<i>See also</i> Flotation.	
R.		Smelters, zinc ore requirements of.....	11
Ralston, O. C., acknowledgment to.....	103, 106, 120	Sodium chloride, roasting sulphides with.....	68
cited.....	53	Spelter, production in United States, 1914....	12
Recovery, zinc, various processes, comparison		Stone, G. C., cited.....	106
of.....	18	Stott, G. F., on mining and milling complex	
Retort, smelting, zinc ores suited to.....	11	ores.....	24-37
Richards, R. H., on electrostatic separation.....	15	Success mine, Idaho, ores from, analyses of..	22
Roaster, for magnetic separation, description		Sulphate roasting, difficulties of.....	80
of.....	45	tests of.....	56-78
Roasting, effects on solubility of lead and		reasons for.....	55-56
zinc, tests of.....	62-63	<i>See also</i> Mills and mines named.	
curves showing.....	62-63	Sulphate solution, neutral analyses of.....	127
oxidized zinc ore.....	106, 120	zinc precipitation of. <i>See</i> Calcium chlo-	
speed of, effects of size of ore on, curves		ride, as precipitant; Lime, as pre-	
showing.....	61	cipitant.	
effect of size of ore on, tests of.....	61-62	Sulphides, flotation of. <i>See</i> Flotation, sul-	
effect of temperature on, curves showing.....	57,	phide ores.	
tests of.....	60, 62	leaching of. <i>See</i> Leaching sulphides.	
sulphides, laboratory tests of.....	60-61	zinc, analyses of.....	22
<i>See also</i> Chloridizing roasting; Oxide	68	experiments on, outline of.....	23
roasting; Sulphate roasting; Mag-		flotation tests of.....	38-52
netic roasting.		hydrometallurgical difficulties of.....	79
S.		hydrometallurgical tests for.....	79-101
Santaquin King mine, Utah, calcining oxi-		production, United States, 1914.....	12
dized ore at, results of.....	106	roasting tests of.....	53-79
ore of, analyses of.....	21, 126	zinc-iron, flotation of oxidizing agents i	
leaching tests at, results of.....	126	roasting before flotation of.....	41-42
zinc sulphate solution, neutral, analysis of		separation problems of.....	41
Scranton mine, Utah, calcining oxidized ore		zinc-lead, analyses of, results of.....	63
at, results of.....	106	differential flotation of.....	40
ores of, analyses of.....	21, 125	separation problems of.....	40
leaching tests of, results of.....	125, 126, 131	<i>See also</i> Acids; Concentration; Flo-	
zinc sulphate from, neutral solution, anal-		tation; Leaching roasting; Chlo-	
ysis of.....	127	ridizing roasting; Oxide roasting;	
Selective flotation, definition of.....	40	Sulphate roasting; Magnetic roast-	
<i>See also</i> Flotation; Differential flotation.		ing.	
Semioxidized zinc ores, analyses of.....	21	Sulphuric acid, differential flotation, use of..	39
roasted, screen analyses of, result of.....	73	concentrated leaching with, efficiency of,	
roasting, tests of.....	73-74	curves showing.....	123
roasting and leaching, results of.....	73-74	hot, for leaching, tests of, results of.....	125
solubility of, effects of roasting on.....	74-75	leaching with.....	89, 124-129
curves showing.....	75	leaching zinc sulphides with, difficulties	
Separation processes. <i>See</i> Electrostatic sepa-		of.....	80-81
ration; Magnetic separation.		loss of, in precipitation.....	129
Sholes, W. R., acknowledgment to.....	88	substitute for, niter cake as.....	129
Silicic acid, purification of solutions of, tests of		10 per cent, for leaching, tests of, results of.	125
Silicic acid gel, in leaching solutions, effect of		<i>See also</i> Acids; Leaching.	
removal of.....	127-128	Sulphurous acid, leaching oxidized ore, re-	
Silver King Coalition mill, Utah, carbonate		sults of.....	131
slimes at, treatment of.....	35	leaching zinc calcines with, difficulties of.	81-82
costs at.....	36	experiments on.....	82-84
ores treated in.....	34	strength of, effect on velocity of solution	
sulphide ores, flotation of.....	35	of zinc oxide, curves showing.....	83
tailings losses at.....	28	zinc calcine leached with, screen analyses	
		of.....	83
		<i>See also</i> Acids; Leaching.	

T.		Page.		Page.
Tailings, recovery from, Park City, Utah.....	26-27		Wisconsin zinc, milling in	38, 45
Tailing flats below Park City, mills on, data on.....	36-37		Woolf, W. G., acknowledgment to.....	53, 79, 120
See Beggs mill; Broadwater mill; Big Four mill.			Wright, C. A., acknowledgment to.....	38
Tailing losses, Park City district.....	27-28		cited.....	14, 15, 24, 38
Temperature, effect on speed of roasting. See Roasting speed, effect of temperature on.			Y.	
Timber Butte mine, Mont., ores from, analyses of.....	22		Yellow Pine, Nev., calcining oxidized ore at, results of.....	106
Trapper mine, Mont., tailings from, analysis of.....	21		ores of, analyses of.....	21
U.			Young, O. E., acknowledgment to.....	79, 88, 120
Udy, M. J., acknowledgment to.....	53, 79		Z.	
United States smelter, Utah, ore from analysis of.....	22		Zinc, concentrates, production, United States, 1914.....	12
Utah-Apex mine, Utah, ores of, composition of.....	46		production, Park City district, Utah....	25
tests of.....	46-47		roasting of.....	53-79, 105-120
zinc-iron middling of, analysis of.....	47		Zinc-iron sulphides. See Sulphides, zinc-iron.	
magnetic separation at.....	46-47		Zinc-lead sulphide. See Sulphides, zinc-lead.	
results of.....	47		Zinc ores, oxidized, concentration tests of..	102-120
W.			hydrometallurgical tests for.....	121-136
Wasie mine, Mont., ore of, analyses of, results of.....	69		not utilized, present source of, figure showing.....	14
roasted, leaching tests of.....	73		present source of, figure showing.....	14
roasting and sulphuric-acid leaching of.....	76-79		suited to retort smelting.....	11
screen analyses of, results of.....	69		See Acids; Flotation; Gravity concentration; Igneous concentration; Leaching; Magnetic separation.	
Western Mining Co., Colo., calcining oxidized ore, results of.....	106		Zinc oxide plant, plan and sections of, figure showing.....	114
mine, ore of, analysis of.....	21, 125		50-ton, costs and profits of.....	118
leaching tests at, results of.....	126		erection of, costs of.....	115
zinc sulphate solution, neutral, analysis of.....	127		operation costs of, curves showing.....	118-119
			25-ton, costs and profits of.....	116
			erection of, costs of.....	115
			operation of, costs of.....	115
			curves showing.....	116, 117
			Zinc sulphides. See Sulphides, zinc.	







DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, SECRETARY

BUREAU OF MINES

VAN. H. MANNING, DIRECTOR

**ILLINOIS MINING STATUTES
ANNOTATED**

BY

J. W. THOMPSON

INCLUDING ALL ILLINOIS MINING LAWS



WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

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First edition. October, 1918.

GENERAL SUBJECTS TREATED.

	Page.
Actions for wrongful death.....	1
Burying dead miners.....	2
Constitution.....	2
Department of Mines and Minerals.....	437
Eminent domain.....	5
Engineering department at University.....	10
Explosives.....	11
Geologist—Geological Survey.....	19
Mine fire-fighting and rescue stations.....	28
Mine fire-fighting equipment.....	33, 441
Mine inspectors.....	48
Mine managers.....	54
Minerals.....	57
Mineral lands.....	60
Miners' examining board—State mining board.....	62
Miners' examining board—Examination of miners.....	92
Miners' and mechanics' institutes.....	104
Miners' liens.....	105
Miners' wages—Payment.....	106
Miners' wash rooms.....	111
Mining corporations.....	114
Mining investigating commission.....	124, 443
Mining leases—Release.....	126
Mining operations.....	128, 445
Mining rights—Conveyance.....	343
Oil and oil wells.....	346
Salines.....	350
Shot firers.....	376
Taxation.....	381
Weighing coal.....	385
Workmen's Compensation Acts.....	394, 447, 459
Publications relating to mining laws.....	464

CONTENTS.

	Page.
Actions for wrongful death	1
Burying dead miners	1
Burying bodies of dead miners.....	1
Constitution	2
Legislation for safety of miners.....	2
Constitution requires laws protecting miners.....	2
Construction of constitutional provision—Classification.....	3
Statutes complying with requirements—Construction.....	3
Railroads to coal banks.....	4
Constitutionality of section.....	4
Eminent domain	5
Drainage of mines.....	5
Drains and roads.....	6
Draining coal mine.....	7
Construction of drains and levees.....	8
Engineering department at University	10
Mining Engineering Department at University.....	10
Explosives	11
Location—Nuisance.....	11
Regulations.....	11
Powder in coal mine.....	15
Explosives in coal mines—Black powder.....	16
Permissible explosives.....	17
Geologist—Geological Survey	19
Geological Survey—Resolution.....	19
State Geologist.....	19
Geologist—Appropriations—Report (Vol. 3)—Repealing act.....	21
Appropriation—Report (Vol. 4).....	21
Appropriation—Report (Vol. 5).....	21
Appropriation—Report (Vol. 6).....	22
Appropriation—A. Paine.....	22
Appropriation—Report (Vol. 7).....	22
Appropriation—Report (Vol. 8).....	23
Geological Survey in University.....	24
Geological Commission—Appropriation.....	25
State Geological Commission—Appropriation.....	26
State Geological Commission—Appropriation.....	27
Mine fire-fighting and rescue stations	28
Fire fighting and rescue stations.....	28
Mine-rescue stations—Appropriation.....	32
Mine fire-fighting equipment	33
Fire-fighting equipment.....	33

	Page.
Mine inspectors	48
Inspectors to furnish information to geologists.....	48
Duty as to weighing coal.....	48
Revisions and amendments.....	49
Appropriation.....	50
Board of examiners—Appropriations.....	51
Board of examiners—Salaries.....	51
Appropriations.....	52
Instruments used in mines—Appropriation.....	52
Appropriations.....	53
Mine managers	54
Foreman, pit boss, fire boss, hoisting engineer.....	54
Examination and employment.....	54
Certificates to fire bosses and hoisting engineers.....	56
Minerals	57
Lead—Sales regulated.....	57
Trespass on coal banks.....	58
Mineral lands	60
Mining over line—Examination of mine—Survey.....	60
Mining over line—Trespass.....	60
Miners' examining board—State mining board	62
Examination of inspectors—Appointment.....	62
Inspectors—Amendatory act.....	66
Miner—Certificate of competency.....	67
State Mining Board.....	67
Revised act—State mining board.....	70
Appropriations.....	90, 91
Miners' examining board—Examination of miners	92
Evidence of competency.....	92
Examination and certificates.....	92
Miners' examining board.....	94
Constitutionality of statute.....	101
Purpose of statute—Police power.....	102
Members of board—Residence and qualification.....	102
Certificated miners—Employment—Capacity.....	102
Violation of statute—Penalty.....	103
Miners' examining board—Appropriation.....	103
Appropriation.....	103
Miners' and mechanics' institutes	104
Appropriations.....	104
Miners' liens	105
Laborers' and miners' liens.....	105
Miners employed by receiver.....	105
Character of work—Application of statute.....	105
Miners' wages—Payment	106
Truck system prohibited.....	106
Construction and validity of statute.....	106
Weekly payment.....	107
Construction and validity of statute.....	108
Payment in money.....	109
Validity and purpose of act—Effect on contracts.....	109
Semimonthly payment.....	110

	Page.
Miners' wash rooms	111
Mine operators to provide wash rooms.....	111
Statute unconstitutional.....	111
Employers to provide wash rooms.....	111
Statute constitutional.....	112
Purpose of statute.....	113
Mining corporations	114
Formation of mining corporations.....	114
Mining and transportation companies.....	115
Formation of corporations.....	119
Eminent domain—Right of way.....	119
Combines, pools, trusts, etc.....	120
Unlawful combinations—Sufficiency of charge.....	121
Mining corporations—Classification.....	122
Construction and validity of statute.....	122
Constitutionality of amendments.....	123
Owning stock in railroad companies.....	123
Mining investigating commission	124
Commission to investigate mining.....	124
Mining leases—Release	126
Oil leases—Release.....	126
Release by heirs, representatives, etc.....	126
Mining operations	128
Mining regulations—Original act.....	128
Signals—Employment of children.....	133
Third amendatory act.....	133
Inspection by surveyor.....	136
Notice of accidents—Person in charge.....	136
Owner of mine—Liability for penalty.....	136
Escapement shaft—Time for construction.....	137
Shafts—Entrance protected.....	137
Liability of operator for mistakes of inspector.....	137
Shaft—Lighting—Proof.....	137
Application and protection of statute—Workman.....	137
Failure to comply with statute—Proximate cause.....	138
Willful violation of statute.....	138
Underground workings—Application of statute.....	139
Contributory negligence—Knowledge of danger.....	139
Action for death—Who may sue—Pleading.....	139
Death of miner—Action by widow.....	140
Repeal.....	140
First general revision, 1879.....	141
Regulation of mines.....	141
Appointment and duties of inspectors.....	162
Constitution requires safety statutes.....	167
Constitutionality of statute—Classification.....	168
Construction, purpose, and enforcement of statutes.....	168
Coal mining—Police power—Inspection fees.....	169
Care required—Safe places—Miner's working place.....	170
Inspection—Duty to examine and make report—Compliance.....	170
Inspection—Number—Discretion of inspectors—Fees.....	171
Report of mine examiner—Sufficiency.....	172

Mining operations—Continued.**First general revision, 1879—Continued.**

	Page.
Appointment and duties of inspectors—Continued.	
Escapement shaft—Requirement—What constitutes	172
Lights and gates at shafts—Failure to provide	173
Roadway—Meaning and proof	174
Duty as to haulageways	174
Employment of engineer—Competency—Question of fact	174
Props—Duty of operator to furnish	175
Props—Miner's duty as to his working place	176
Requirements of top man and bottom man	176
Notice of nonobservance of statute—Duty	177
Willful failure to comply with statute—Question of fact	177
Willful violation of statute—What constitutes—Proximate cause	178
Willful violation of statute—Question of fact—Proof	179
Negligence of operator—Care exercised by miner	180
Care required of miner	180
Miner may assume operator has complied with statute	181
Contributory negligence of miner	181
Assumption of risk—Knowledge of danger	183
Statute not abrogated by contract	183
Vice principal or agent—Duties—Right to recover	183
Action for death—Who may sue—Single recovery	184
Purpose of survey	185
Mining under surface—Damages	186
Repealing effect	186

Second general revision, 1899

Trappers—First amendatory act	203
Inspectors—Second amendatory act	203
Mine examiners—Third amendatory act	203
Boundaries—Fourth amendatory act	204
Signals—Fifth amendatory act	204
Employment of boys and women—Sixth amendatory act	205
State Mining Board—Seventh amendatory act	205
Maps—Eighth amendatory act	207
Failure to comply—Penalties—Ninth amendatory act	208
Refuge holes—Tenth amendatory act	209
Explosives—Eleventh amendatory act	210

Third general revision, 1911

Statute enacted pursuant to constitution	247
Mining hazards—Legislation—Classification	248
Constitutionality of statute—Police power of State	248
Purpose of statute	249
Construction and amendment	250
Mine—Meaning—Application of statute	250
Miner—Meaning—Application of statute	251
Shaft—Meaning—Duty to maintain	252
Inspection—Extent of examination—Compliance with statute	254
Mine operators—Duties generally—Good faith	256
Duty of mine operator to adopt and post rules	256
Duty of operator to employ mine manager or examiner	257
Assistant mine manager—Employment	258

Mining operations—Continued.

Third general revision, 1911—Continued.

	Page.
Mine managers and examiners—Duties.....	259
Delegation of duties—Power to exempt from liability.....	260
Vice principal—Manager and examiner.....	260
Competency of mine examiner—Effect of certificate.....	261
Mine examiner—Right to protection of statute.....	262
Liability and nonliability of operator—Instances.....	262
Duty of operator—Miner may assume performance.....	263
Hoisting engineers—Duty to employ—Right to discharge.....	263
Hoisting machinery—Duty—Care required—Liability.....	264
Signals—Additions by operator.....	266
Fencing shaft and landings—Gates and cages.....	266
Lighting shaft—Duty and liability—Question of fact.....	266
Lighting shaft—Landings—Meaning.....	267
Haulage ways—Duty and liability of operators.....	268
Refuge places—Meaning of requirement—Duty and liability.....	268
Lights on motors and cars.....	270
Props—Duty of operator to furnish—Liability for failure.....	271
Props—Duty of miner to request and set.....	274
Props—Sufficiency of request—Custom.....	275
Ventilation.....	277
Doors—Duty to employ attendants—Good faith.....	278
Doors—Permanent, principal, or temporary—Meaning.....	279
Door attendants required—Purpose of statute.....	280
Crosscuts—Purpose—Failure to make—Liability.....	281
Employment of boys—Repeal—Change of age.....	281
Failure to instruct or warn—Liability.....	282
Fellow servants—Instances.....	282
Dangerous conditions or places—Meaning—Duty to mark— Pleading.....	282
Dangerous conditions—Places above ground.....	286
Dangerous conditions—Electrical appliances—Excessive voltage.....	286
Dangerous conditions—Determination—Good faith.....	287
Dangerous conditions—Knowledge or want of knowledge—Care required.....	288
Dangerous conditions—Marking—What constitutes.....	289
Dangerous conditions—Failure to mark—Liability.....	290
Dangerous conditions—Marking not required.....	292
Dangerous conditions—Records—What constitute.....	293
Dangerous conditions—Work under mine manager—Meaning.....	294
Dangerous conditions—Changes in act of 1911.....	296
Duties imposed on miners.....	297
Miner's working place—Danger—Recovery for injury.....	298
Miner making dangerous place safe—Recovery for injury.....	300
Miner within scope of employment.....	303
Shot firers—Application of statute.....	303
Compliance with statute—Liability for failure.....	304
Willful violation of statute—What constitutes.....	305
Willful violation—Good faith—Excuse.....	307
Willful failure of mine manager to obey statute—Liability of operator.....	308
Violation of statute—Proximate cause of injury.....	309

Mining operations—Continued.

Third general revision, 1911—Continued.

	Page.
Violation of statute—Failure to show proximate cause—Instances	312
Violation of statute—Concurring or contributory cause of injury	313
Violation of statute—Proof and presumptions	314
Violation of statute and negligence—Distinction	316
Negligence of operator—Statutory and common-law liability	317
Employment of boys—Construction and purpose of act	318
Action by injured miner—Pleading and proof—Recovery	319
Action by injured miner—Instructions by court	322
Action for death—Right to sue—Widow or dependents	323
Action for death—Measure of damages—Proof	325
Action for death—Proof of dependence	326
Action for death—Parties—Change in statute	327
Action for death—Limitation	329
Cause of action saved	329
Contributory negligence—Defense abrogated	331
Contributory negligence—Miner's violation of duty	336
Assumption of risk—Risks assumed by miner	336
Assumption of risk—Risks not assumed by miners	337
Proof of similar acts—Admissibility	337
Expert evidence—Admissibility—Instances	338
Questions of fact—Instances	339
Damages—Single recovery	341
Mining rights—Conveyance	343
Sale or lease of mining rights	343
Codified in Revised Statutes, 1874	343
Mining rights—Conveyance or lease	343
Mining rights—Taxation	344
Oil and oil wells	346
Oil—Inspection	346
Inspection of oil	347
Inspectors and inspection	349
First amendatory act	350
Oil inspection—Second amendatory act	351
Oil inspection—Third amendatory act	351
Oil inspection—Repealing act	352
Gambling in petroleum	354
Oils used in coal mines	354
Oil—Testing—Amendatory act	355
Plugging oil and gas wells	356
Oil well near coal mine—Amendatory act	357
Salines	359
Salt springs—Acceptance	359
Saltpeter	359
Saltpeter caves	359
Leasing salines	360
Discovery of salt water	360
Rents from salines	361
Leasing salines	361
Gallatin County saline	362

Salines—Continued.	Page.
Superintendent of Gallatin County saline.....	363
Vermillion saline.....	364
Relief of lessees.....	364
Fencing off salines.....	365
Leasing of Big Muddy saline.....	365
Vermillion saline.....	365
Gallatin County saline.....	366
Appropriating sums received from sales of salines.....	368
Gallatin County saline.....	369
Manufacture of salt.....	369
Vermillion saline.....	370
Gallatin saline.....	371
Manufacture of salt at Gallatin saline.....	372
Jackson County saline.....	373
Gallatin County saline.....	374
Sale of Gallatin County saline reserve.....	374
Shot firers	376
Shot firers—Operators to furnish.....	376
Duties of shot firers—First amendatory act.....	377
Duties of shot firers—Second amendatory act.....	378
Shot firers' act—Nature and validity.....	378
Shot firers protected.....	379
Purpose and construction of amendatory act.....	379
Actions for injuries or death.....	379
Taxation	381
Real property and corporate stocks.....	381
Weighing coal	385
Weight of bushel.....	385
Weighing coal at mines.....	386
Validity of statute.....	386
Construction and purpose of statute.....	387
Weight of coal as basis of wages.....	387
Failure to comply—Defense.....	387
Weighing coal at mines—Amendatory act.....	388
Validity of statute.....	389
Weighing coal at mines—Repealing act.....	389
Constitutionality of statute.....	390
Check weighmen—Amendatory act.....	391
Amendatory act—Validity.....	391
Weighing coal in gross.....	391
Construction and validity of statute.....	392
Scales and weighman.....	392
Duty of mine operators as to weighing coal.....	393
Workmen's compensation act	394
Compensation for accidental injuries.....	394
Workmen's compensation act—Second general act.....	403
Workmen's compensation—Amendatory act.....	418
Constitutionality of act—Classification.....	430
Construction and application of act.....	431
Election by employer to pay compensation—Defenses.....	431
Election by employee—Condition.....	432
Election by employer and employee—Remedy—Practice.....	432

Workmen's compensation act—Continued.

Workmen's compensation—Amendatory act—Continued.	Page.
Election to accept—Presumption.....	432
Rejection by employer—Effect and liability—Proof.....	432
Rejection by employee—Notice.....	433
Defenses available to employer.....	433
Miner's right to recover for injury—Proof.....	433
Contributory negligence of miner—Effect on recovery.....	434
Procedure under act—Arbitration.....	434
Notice of injury—Sufficiency.....	434
Disability—Permanent and partial—Increased—Review.....	434
Industrial Board—Jurisdiction—Conclusiveness of finding— Appeal.....	435
Application of statute.....	436
Session laws of 1917.....	437
Department of Mines and Minerals.....	437
Creation of Department of Mines and Minerals.....	437
Department of Mines and Minerals—Powers.....	438
Appropriations.....	440
Mine Fire Fighting Equipment.....	441
Equipment for mine fire fighting.....	441
Mining Investigating Commission.....	443
Investigating commission.....	443
Mining operations.....	445
Ventilation.....	445
Workmen's Compensation Act.....	447
Amendatory act.....	447
Workmen's Compensation Act.....	450
Second amendatory act.....	450
Publications relating to mining laws.....	404
Contents of entire index.....	467
Session Laws Compiled and Annotated.....	468
Constitution—Sections Compiled and Annotated.....	472
Revised Statutes, 1845—Revisions Compiled and Annotated.....	473
Callaghan Statutes—Statutes Compiled and Annotated.....	474
Courtright Statutes—Statutes Compiled and Annotated.....	475
Hurd's Revised Statutes—Revisions Compiled and Annotated.....	477
Jones & Addington's Statutes—Revisions Compiled and Annotated.....	496
Starr & Curtiss Statutes—Revisions Compiled and Annotated.....	498
Table of Illinois cases.....	502
Table of foreign cases.....	509
Index.....	511

ILLINOIS MINING STATUTES ANNOTATED.

By J. W. THOMPSON.

[Mining subjects arranged alphabetically.]

ACTIONS FOR WRONGFUL DEATH.

See Mining operations, page 128.

BURYING DEAD MINERS.

BURYING BODIES OF DEAD MINERS.

REVISED STATUTES (HURD) 1874, P. 223.

SEC. 22. LIABILITY OF RAILROADS, ETC., FOR BURIAL EXPENSES.—When any railroad company, stage or any steamboat, propeller, or other vessel engaged in whole or in part in carrying passengers for hire, brings the dead body of any person into this State, or any person dies upon any railroad car or in such stage, steamboat, propeller or other vessel in this State, or any person is killed by cars, or machinery of any railroad company or by accident thereto or by accident to or upon any such stage, steamboat, propeller, or other vessel, or by accident to or in or about any mine, mill or manufactory,* the company or person owning or operating such cars, machinery, stage, steamboat, propeller, or other vessel, mine, mill or manufactory shall be liable to pay the expenses of the coroner's inquest upon and burial of the deceased and the same may be recovered in the name of the County in any court of competent jurisdiction.

NOTE.—The original Act of February 15, 1855 (Laws 1855, p. 170), makes no reference to the dead bodies of persons killed "by accident to, in or about any mine."

AMENDATORY ACT.

LAWS 1917, P. 341.

JUNE 26, 1917.

REVISED STATUTES (HURD) 1917, P. 622.

NOTE.—This Act amends the above section requiring the burying of the bodies of dead miners, but the only substantial change is in the following words, to be inserted, at the *:

* and such death shall have been caused by the wrongful act, neglect or default of any such railroad company, stage, steamboat, propeller or other vessel owner, or of the owner of any mine, mill or manufactory.

CONSTITUTION.

LEGISLATION FOR SAFETY OF MINERS.

CONSTITUTION OF 1870, ARTICLE 4, SEC. 29.

ARTICLE 4. * * *

SEC. 29. It shall be the duty of the General Assembly to pass such laws as may be necessary for the protection of operative miners, by providing for ventilation when the same may be required, and the construction of escapement shafts, or such other appliances as may secure safety in all coal mines, and to provide for the enforcement of said laws by such penalties and punishments as may be deemed proper.

* * * * *

ANNOTATIONS.*

1. CONSTITUTION REQUIRES LAWS PROTECTING MINERS.
2. CONSTRUCTION OF CONSTITUTIONAL PROVISION—CLASSIFICATION.
3. STATUTES COMPLYING WITH REQUIREMENT—CONSTRUCTION.

1. CONSTITUTION REQUIRES LAWS PROTECTING MINERS.

The mandatory provision of this section requires the general assembly to give coal operators special legislative protection against the hazards and perils peculiar to the mining business.

Kellyville Coal Co. v. Strine, 217 Ill. 516;
Cook v. Big Muddy-Carterville Mining Co., 249 Ill. 41;
Rogers v. St. Louis-Carterville Coal Co., 254 Ill. 104 p. 110.

The constitution requires the general assembly to pass such laws as may be necessary for the protection of operative miners and a statute passed pursuant to such constitutional provision should be given meaning in harmony with the purpose where the language used will admit of such construction.

Robertson v. Donk Bros. Coal & Coke Co., 143 Ill. App. 391 p. 394.

The constitution authorizes special legislation as to mining and makes it the duty of the general assembly to provide such laws as may be necessary for the protection of miners and such appliances as may secure safety in coal mines, and courts are not required to look to other occupations and determine whether such law did or did not affect such occupations, or whether it was or was not a danger that was common to other occupations. The purpose of this amendment was to place the mining laws in a class by themselves.

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370 p. 376.

The constitutional provision requiring legislative enactment for the health and safety of operative miners was deemed advisable by reason of their being exposed in their occupation to extraordinary hazards and perils different from other classes of laborers.

Kellyville Coal Co. v. Strine, 217 Ill. 516;
Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41;
Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150 p. 153.

* The references to all cases in the Reporter system are shown in the Table of Cases (pp. —) only.

This section enjoins legislation in the interest of miners but this is solely as respects their personal safety and reference to enactments of police regulations to promote that end. It recognises that the business is dangerous to life and health, but it nowhere intimates that there is anything in the business which disqualifies parties engaged therein from contracting as they choose in regard to such matters, or that gives the public a use in such business.

Millett v. People, 117 Ill. 294 p. 304.

The constitution requires the general assembly to pass laws for the protection of operative miners by providing for ventilation and the construction of escapement shafts or other appliances as may secure safety in coal mines.

Smith v. Moffat Coal Co., 151 Ill. App. 362 p. 363.

Under this constitutional requirement the legislature enacted the law of 1899 for the protection of operative coal miners, which was amended in 1907 and again amended in 1911.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150 p. 153.

2. CONSTRUCTION OF CONSTITUTIONAL PROVISION—CLASSIFICATION.

Section 29 of Article IV of the constitution makes it the duty of the general assembly to pass such laws as may be necessary for the protection of operative miners, by providing for ventilation, the construction of escapement shafts and such other appliances as may make secure safety in coal mines. This provision requires the legislature to pass such laws as may be necessary for the purposes specified, and leaves to that body the determination of the policy of the state as to what legislation is necessary to conform to its requirements.

Chicago etc. Coal Co. v. People, 181 Ill. 270 p. 272;

Carterville Coal Co. v. Abbott, 181 Ill. 495 p. 500;

Consolidated Coal Co. v. People, 186 Ill. 134 p. 138;

Kellyville Coal Co. v. Strine, 217 Ill. 516 p. 525.

This section places coal miners in a class by themselves and requires the general assembly to pass such laws as may be necessary for their protection by providing for ventilation when the same may be required and the construction of escapement shafts or other necessary appliances. The word "appliances" is very broad and includes anything applied or used as a means to an end, and this provision includes all those things which will secure safety in coal mines and is intended to secure the safety of those persons engaged in a perilous occupation and it should not receive a narrow construction, and it must be held to include all the physical conditions existing in the mine.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 47.

See *Mertens v. Southern Coal Co.*, 235 Ill. 540;

Dunham v. Black Diamond Coal Co., 239 Ill. 457;

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Cook v. Big Muddy-Carterville Mining Co., 249 Ill. 41;

Rogers v. St. Louis-Carterville Min. Co., 254 Ill. 104, p. 110.

3. STATUTES COMPLYING WITH REQUIREMENT—CONSTRUCTION.

The statutes passed in obedience to this constitutional mandate should be liberally construed towards the accomplishment of its purpose.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 65.

See *Durkin v. Kingston Coal Co.*, 171 Pa. 193;

Fulton v. Wilmington Star Min. Co., 133 Federal 193;

Williams v. Thacker Coal Co., 44 W. Va. 599.

The mining statutes were passed in obedience to the mandate of section 29, article 4 of the constitution which recognized the dangerous character of the occupation of miners and required legislation for their protection and because of this the mining act passed in obedience to this mandate of the constitution is to be liberally construed.

Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 190, p. 203;
Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 376.

RAILROADS TO COAL BANKS.

CONSTITUTION 1870, ARTICLE 13, SEC. 5.

ARTICLE 13. Warehouses * * *

SEC. 5. * * * and all railroad companies shall permit connections to be made with their track, so that any consignee, and any public warehouse, coal bank, or coal yard, may be reached by the cars on said railroad.

ANNOTATIONS.

CONSTITUTIONALITY OF SECTION.

This section requiring railroad companies to permit connections to be made with their tracks so that coal banks or coal yards may be reached is constitutional and valid for the reason that similar provisions apply to other lines of business and the provision affects the duty of the carrier alone as no duty or obligation is put on the owner of the coal bank or coal yard.

Millett v. People, 117 Ill. 294, p. 304.

EMINENT DOMAIN.

DRAINAGE OF MINES.

LAWS 1867, P. 26 (EXTRA SESSION).

FEBRUARY 21, 1867.

AN ACT relative to mining for lead ore or other minerals.

SECTION 1. Be it enacted, etc., That every corporation, company, association of persons or other party now engaged in mining for lead ore or other minerals, or which may hereafter be engaged in operating or mining for lead ore or other minerals, whenever it is necessary for the purpose of prosecuting such mining enterprise to conduct or convey the water from any shaft, levels or land occupied by them for mining purposes, shall have the right and privilege of conducting and conveying the water therefrom, upon, over or below the surface of the lands of any owner or owners of lands adjoining or adjacent to the grounds so worked or to be used for mining purposes by such corporation, company, association of persons or other party, in pipes, ditches, water races or tunnels, and to deposit waste earth from their said mines, thereby doing as little damage or injury to the owner or owners of adjoining lands or the improvement thereon as the same will admit of, with the privilege of extending said pipes, ditches, water races or tunnels as far over adjacent lands as may be necessary to obtain a proper outlet for the water, upon complying with the provisions of this act.

SEC. 2. Whenever such corporation, company or other party can not agree with the owner or owners of such adjoining lands upon the amount of damages for the right and privilege of conveying the water from any shaft, level or mining land aforesaid, such corporation, company or association of persons, or other party, may apply to the judge of the county court of the county where the land is situated for the appointment of three commissioners, to assess such damage. The judge of said county court, upon such application being made, shall appoint three disinterested freeholders, residents of his county, to act as commissioners, who, after being duly sworn for that purpose, shall proceed to make an examination of all the lands necessary and proper to be used by said company, corporation, association of persons, or other property in conducting or conveying the water from such shaft, level or mineral lands, and for depositing waste earth, as aforesaid, and also for such lands as may be overflowed or liable to overflow by reason of erecting, constructing and maintaining such pipes, ditches, tunnels or the keeping up and maintaining water-races upon said lands, and make an award, in writing, in which they shall award to the owner or owners of such land or lands the amount of damages to which such owner or owners of said land or lands shall be entitled, by reason of use of lands for waste earth and for the erection, construction and maintaining such pipes, ditches, tunnels or water-race, or that may be erected and maintained for the purpose of conveying the water from the same.

SEC. 3. Said commissioners shall meet within thirty days from the time of their appointment to make their examination and award, by virtue of this act, and shall have power to adjourn, from time to time, not exceeding two adjournments in all; and the owner or owners of such land shall be notified to

appear before them, at the time and place of such meeting, and shall be entitled to be heard before said commissioners in regard to the amount of damages by them sustained or liable to be sustained in consequence of the erecting, making and maintaining of such pipes, ditches, tunnels or water-races, and depositing waste earth, as aforesaid. Such notice shall, at least six days before such meeting, be served personally or by leaving a copy thereof at the residence of the owner or owners of such land aforesaid: Provided, Such owner or owners reside in the county where said lands are situated; and in case such owner or owners are nonresidents of the county, then such notice shall be served upon their attorney or agent, if they have any in such county, and if there is no such agent or attorney in the county then such notice shall be published in a newspaper printed in said county for at least three weeks before the meeting of said commissioners.

SEC. 4. The decision and award of said commissioners shall be final, unless appealed from as provided for in this act; and the said award, together with due proof of the notice or notices upon the owner or owners of said land, or upon their attorney or agent, as provided for in this act, shall be filed in the office of the clerk of the circuit court of the county wherein the award is made, shall be prima facie evidence of the regularity of said proceedings, and at the next term of the circuit court of the proper county, upon motion made by any party interested therein, a judgment may be entered up and execution issued to the same effect and in the same manner as judgments are entered, executions issued upon actions of civil nature commenced and tried in the circuit court.

SEC. 5. Any corporation, company, association of persons, or other party considering themselves aggrieved by the award of said commissioners, may appeal therefrom, within twenty days from the time of filing said award, to the circuit court of the proper county, in the same manner as is provided by law for appeals from judgments of a justice of the peace. Said commissioners shall be entitled to receive two dollars per day, each, for their services as such commissioners, which shall be paid by such corporation, company or party.

SEC. 6. And it is hereby expressly provided, that the pipes, ditches, and water-races or tunnels laid, excavated or constructed by virtue of the provisions of this act, shall, under no circumstances, be used by the owners of the lands through which they may be laid or constructed or by any other person or persons, for any purpose whatsoever other than the drainage of the lands; and no person or persons whatsoever shall be authorized to enter the same, except for the purpose of repairing, altering, extending or otherwise improving the same, without the written consent of the parties interested first had and obtained.

SEC. 7. This act shall take effect and be in force from and after its passage.

DRAINS AND ROADS.

REVISED STATUTES (HURD) 1874, P. 709.

MARCH 24, 1874.

AN ACT To revise the law in relation to mines.

NOTE.—The Revised Statutes of 1874 were prepared by a Commission appointed by the Legislature, and were issued and known as Hurd's Revised Statutes.

SEC. 1.—MAKING DRAINS, ROADS OR RAILROADS—EMINENT DOMAIN.—Be it enacted, etc.: That whenever any mine or mining place shall be so situated that it can not be conveniently worked without a road or railroad thereto, or ditch to drain the same or to convey water thereto, and such road, railroad or ditch

shall necessarily pass over, through or under other land owned or occupied by others, the owner or operator of any such mine or mining place may enter upon such lands, and construct such road, railroad or ditch, upon complying with the law in relation to the exercise of the right of eminent domain.

PUBLIC AND PRIVATE WAYS—HORSE AND DUMMY RAILROAD.—And the commissioners of highways of any county under township organization, and the county board in counties not under township organization, may, when the public good requires, cause to be laid out and opened public highways, or private roads or cartways, from any coal mine to a public highway or to a railway, as the public good may require, in the same way as now is or may hereafter be provided by law for the laying out and opening of public highways or private roads or cartways, and may permit the owner, lessee or operator of any coal mine to lay down and operate a horse or dummy railway thereon, or upon any highway or private road or cartway now or hereafter laid out and opened for public or public and private use, but always in such a manner and way, and upon such place thereon, as to not unnecessarily interfere with ordinary public travel.

DRAINING COAL MINE.

LAW 1877, P. 95.

MAY 16, 1877.

AN ACT To protect, by levee, lands subject to overflow and for draining wet or swamp land and coal mines.

SECTION 1. PETITION.—Be it enacted, etc.: That when any one or more owner or owners or occupants of any lands, or coal mines, in the State, shall desire to construct a ditch or drain or ditches across the lands of another or others, for agriculture, sanitary or mining purposes, or for all or any one of said purposes, and which tends to the benefit or advantage of the public, and no agreement or arrangement can be made between them and the owners or occupants of said land to make or establish the ditch or drain, the person or persons may then file a petition in the circuit or county court of the county in which said ditch or ditches, drain or drains, shall be proposed to be constructed, setting forth the necessity for the same, with the description of its or their proposed starting point, route and terminus, and if it shall be necessary for the drainage of the land, or coal mine, or for sanitary purposes, or either or all of said purposes, that a drain, ditch or levee, or other similar work, be constructed, and to the public interest that the work shall be so constructed, the petitioner or petitioners shall so state in the petition and shall set forth the general description of the same as proposed, and shall ask for the condemnation of so much of the lands as may be sufficient to construct and build said ditch or ditches, drain or drains, levee or levees.

SEC. 2. DRAIN OR DITCH—HOW CONSTRUCTED.—If the petition is for the draining of any coal mine or mines, or for draining wet land, and it is practicable for the ditch or drain to be made under the surface of the ground and to the advantage of the owner, and it shall be so required in writing by the owner or occupant of the land over which the same shall be constructed, then the person or persons so constructing such drain or ditch shall so construct and build the same by laying piping or boxing made of substantial and good material, in a good and substantial manner a sufficient distance under the surface of the ground to avoid obstruction or inconvenience to the owner or occupant of the land; but if it can not be so done, or is unnecessary, then said drain or ditch may be erected upon the surface of the ground, doing as little injury to the owner or occupant as possible.

SEC. 3. COMPENSATION FOR PROPERTY TAKEN.—Private property shall not be taken or damages for the purpose of erecting such ditch, drain or levee without

just compensation if claimed by the owner or occupants, and said compensation shall be ascertained by a jury as hereinafter provided; but if such ditch, drain or levee shall be of benefit to the lands over which it shall be constructed, then the benefits and advantages shall be a set off against compensation that may be claimed by the owner or occupants of such land; but no benefits or advantages shall be set off against the value of the land actually taken. (Repealed by Act June 27, 1885, Laws 1885, 78, p. 108.)

* * * * *

CONSTRUCTION OF DRAINS AND LEVEES.

LAWS 1879, P. 120.

MAY 29, 1879.

AN ACT to provide for the construction, reparation and protection of Drains, Ditches and Levees, across the lands of others, for agricultural, sanitary and mining purposes, and to provide for the organization of Drainage Districts.

SECTION 1. DRAINAGE DISTRICTS.—Be it enacted, etc.: That drainage districts may be organized and established as hereinafter provided.

SEC. 2. PETITION.—Whenever a majority of the owners of lands, within a district proposed to be organized, who shall have arrived at lawful, and who represent one-third ($\frac{1}{3}$) in area of the lands to be reclaimed or benefited, desire to construct a drain or drains, ditch or ditches, levee or levees or other work, across the lands of others for agricultural, sanitary or mining purposes, or to maintain and keep in repair any such drain or drains, ditch or ditches, levee or levees heretofore constructed under any law of this State, such owners may file, in the county court of any county in which the greater part of the lands to be affected by said drain or drains, ditch or ditches, levee or levees, or other work proposed to be constructed, maintained or repaired, shall lie, a petition signed by a majority of the owners of said lands, within said district, proposed to be organized as aforesaid, setting forth the proposed name of said drainage district, the necessity of the same, with a description of its or their proposed starting points, route and terminus, and a general description of the lands proposed to be affected, with the names of the owners, when known. * * *

* * * * *

SEC. 5. HEARING—FINDINGS OF COURT—COMMISSIONERS.—On the hearing of any petition filed, * * * and if it shall further appear to the court that the proposed drain or drains, ditch or ditches, levee or other works is, or are necessary or will be useful for the drainage of the lands proposed to be drained thereby for agricultural, sanitary or mining purposes, the court shall so find, and appoint three disinterested persons as commissioners to lay out and construct such proposed work.

* * * * *

AMENDATORY ACT, 1885.

LAWS 1885, P. 109.

JUNE 30, 1885.

AN ACT to revise and amend an act, and certain sections thereof, entitled "An act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That the sections herein named of an act entitled "An act to provide for the construction, reparation and protection of drains, ditches and levees across the lands of others for agricultural, sanitary and mining purposes, and to provide for the organization of drainage districts,"

approved and in force May 20, 1879, as amended. * * * be and the same are hereby revised and amended, that is to say, that sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 17½, 18, 19, 20, 21, 22, 23, 24, 25 and 26, of said act, to which this act is an amendment, be and each of them is hereby so amended, as to read in their numerical order as follows:

SEC. 2. Whenever a majority of the owners of lands within a district proposed to be organized, who shall have arrived at lawful age and who represent one-third ($\frac{1}{3}$) in area of the lands to be reclaimed or benefited, desire to construct a drain or drains, ditch or ditches, levee or levees, or other work to be known in this act as a "drainage and levee district," or "drainage and levee work," across the lands of others, for agricultural, sanitary and mining purposes, or to maintain and keep in repair any such drain or drains, ditch or ditches, levee or levees, heretofore constructed under any law of this State, or to establish in said district a combined system of drainage or protection from overflow, independent of levees, for agricultural, sanitary or mining purposes, and maintain the same by special assessments upon the property benefited thereby, such owners may file, in the county court of any county in which the greater part of the lands to be affected by said drain or drains, ditch or ditches, levee or levees, or other work proposed to be constructed, maintained or repaired shall lie, a petition signed by a majority of the owners of said lands, within said district proposed to be organized as aforesaid, setting forth the proposed name of said drainage district, the necessity of the same, with a description of proposed starting points, route and terminus of the work and a general description of the lands proposed to be affected, with the names of the owners when known, and, if the purpose of said owners is the repair and maintenance of a ditch or ditches, levee or levees, or other work, heretofore constructed under any law of this State, said petition shall give a general description of the same, with such particulars as may be deemed important, and may pray for the organization of a drainage district, by the name and boundaries proposed, and for the appointment of commissioners for the execution of such proposed work according to the provisions of this act: * * *

SEC. 5. On the hearing of any petition filed under the provisions of this chapter, * * * and if it shall further appear to the court that the proposed drain or drains, ditch or ditches, levee or other works, is or are necessary, or will be useful for the drainage of the lands proposed to be drained thereby, for agricultural, sanitary or mining purposes, the court shall so find, and appoint three (3) competent persons as commissioners, each of whom shall hold his office until his successor is appointed as hereinafter provided, to lay out and construct such proposed work. * * *

ENGINEERING DEPARTMENT AT UNIVERSITY.

MINING ENGINEERING DEPARTMENT AT UNIVERSITY.

LAWS 1900, P. 43.

JUNE 8, 1900.

AN ACT authorizing and directing the establishment of a department of mining engineering in the College of Engineering, at the University of Illinois, and providing for the support of the same.

SEC. 1. Be it enacted, etc.: That the trustees of the University of Illinois be authorized and directed to establish, in the College of Engineering, at the University, a department of mining engineering.

SEC. 2. That the said department of mining engineering shall offer such courses of instruction relating to the science and practice of mining as will best serve to train young men for efficient work in the various phases of the mining industry.

SEC. 3. That in addition to its work of instruction, the said department of mining engineering shall, so far as practicable, concern itself with the development and dissemination of such scientific facts as are likely to be of service in improving the practice of mining, with reference to efficiency in operation, to the security of life in the mines, and to the conservation of the fuel and other mineral resources of the State.

SEC. 4. That there be and hereby is appropriated to the University of Illinois, to meet the cost of establishing and maintaining the said departments of mining engineering, the sum of seven thousand five hundred dollars (\$7,500) per annum.

SEC. 5. The Auditor of Public Accounts is hereby authorized and directed to draw his warrant on the Treasurer for the sum hereby appropriated, payable out of any money in the treasury, not otherwise appropriated, upon the order of the board of trustees of said University, attested by its secretary and with the corporate seal of said university thereto attached.

Approved June 8, 1900.

EXPLOSIVES.

LOCATION—NUISANCE.

REVISED STATUTES 1874, 352, P. 385.

MARCH 27, 1874.

AN ACT to revise the law in relation to criminal jurisprudence.

* * * * *

SEC. 221. NUISANCES—ENUMERATION.—It is a public nuisance:

* * * * *

6. To carry on the business of manufacturing gunpower, nitro-glycerine, or other highly explosive substances, or mixing or grinding the materials therefor, in any building within twenty rods of any valuable building erected at the time such business may be commenced.

7. To establish powder magazines near incorporated towns at a point different from that appointed according to law by the corporate authorities of the town, or within fifty rods of any occupied dwelling house.

* * * * *

REGULATIONS.

LAW 1867, P. 182.

JUNE 16, 1867.

AN ACT to regulate the manufacture, transportation, use and sale of explosives, and to punish an improper use of the same.

SECTION 1. Be it enacted, etc.: That any person, firm, company or corporation who shall make, manufacture, compound, buy or sell, or otherwise procure, or dispose of, or bring within the limits of this State, any dynamite, or any nitro-chlorate, or other explosive compound, with the intent to use the same, or that the same may be used for unlawful injury to or the unlawful destruction of life or property in any place whatsoever, shall be deemed guilty of felony, and, upon conviction thereof, shall be punished by imprisonment for a term of not less than five years nor more than twenty-five years.

SEC. 2. Any person abetting or in any way assisting in making, manufacturing, compounding, buying, selling, procuring, disposing of, storing, removing or transporting any dynamite, nitro-chlorate, or other explosive compound, as above named, either by furnishing the materials, ingredients, skill, means or labor, or by acting as agent, or in any manner acting as accessory before the fact, knowing or having reason to believe that the same is intended to be used by any person or persons in any way for the unlawful injury to or destruction of life or property, shall be deemed principal, and, upon conviction, shall be subject to the same punishment as provided in section 1 of this act.

SEC. 3. Any person soliciting or contributing money or other property for the manufacture, sale, transportation or use of said explosive compounds, knowing or having reason to believe that the same is intended to be used for any unlawful destruction of life or property, shall be deemed guilty of a felony,

and, upon conviction, shall be punished by imprisonment not less than three nor more than twenty-five years.

SEC. 4. That no person, firm, company or corporation shall make, manufacture or compound, within the limits of this State, any dynamite, nitro-chlorate, or other explosive compounds, within one mile of any inhabited dwelling; and no person, firm, company or corporation shall make, manufacture or compound any dynamite, nitro-chlorate, or other explosive compound, without a permit for such purpose, signed by the county clerk of the county in which said manufacturing or compounding is desired to be done, and duly attested with the seal of said official; and the said official issuing the said permit shall keep a record of the names and residences of persons to whom such writ is issued. The officer authorized by this act shall not issue such permit unless the purpose for which said explosive or compound is to be manufactured is a lawful one. Any person, firm, company or corporation making any such compound without such permit shall be guilty of a misdemeanor, and, upon conviction thereof, shall be subject to a fine or imprisonment, or both, in the discretion of the court, such fine to be not less than two hundred dollars nor more than one thousand dollars, and for a second offense shall be deemed guilty of a felony, and be subject to imprisonment in the penitentiary for not less than one year nor more than five years, and a fine of not less than five hundred dollars nor more than two thousand dollars.

SEC. 5. That no person, firm, company or corporation shall store or keep any dynamite, nitro-chlorate, or other explosive compound, within three hundred yards of any inhabited dwelling if the same shall be located within any city, nor within the limits of any city, except in conformity with the existing ordinances governing the storage or keeping of such explosive compound. Any violation of the provisions of this section shall be punished by a fine of not less than one hundred dollars nor more than five hundred dollars.

SEC. 6. It shall be the duty of every person in this State who shall sell or otherwise dispose of any such explosive compound, as above described, to keep a record of the name and residence of every person to whom he disposes of any such explosive compound, and the kind and amount thereof, and the date of such transaction, and such record shall be preserved for not less than three years. All persons, firms, companies or corporations transporting any of the above compounds, shall keep a record of the names and residences of the person, firm, company or corporation forwarding such explosive compound, and of the kind and amount forwarded, together with the name and address of the person, firm, company or corporation to whom the same is forwarded, with the date of its receipt and delivery, and no transportation company shall receive any such explosive compound for transportation, unless the same is marked "explosive," "dangerous" in plainly legible letters on the outside of each and every package. Any violation of the provisions of this section shall be punished by a fine of not less than one hundred dollars, nor more than five hundred dollars. All records, as above described, shall, if any provision of this act shall hereafter be violated, be open to the inspection of the prosecuting attorney of any county where any such violation shall occur, for the purpose of detecting or convicting the person or persons guilty of such violation: Provided, however, that the provisions and restrictions of this law, so far as they shall, or may, relate to the manufacture, sale or transfer of any of the explosive articles herein enumerated, shall not apply to any such articles which shall be consigned to any point without the limits of this State, except that all packages shall be marked "explosive," "dangerous."

SEC. 7. Any person, firm, company or corporation, who by fraud, deception or misrepresentation shall procure the transportation of any such explosive

compound in any public conveyance, shall be deemed guilty of felony, and upon conviction shall be punished by imprisonment in the penitentiary for the term of not less than one year, nor more than five years, and a fine of not less than five hundred dollars nor more than two thousand dollars.

FIRST AMENDATORY ACT, 1889.

LAWS 1889, P. 152.

MAY 28, 1889.

AN ACT to amend section 4 of "An act to regulate the manufacture, transportation, use and sale of explosives, and to punish an improper use of the same," approved June 16, 1887, in force July 1, 1887.

SECTION 1. Be it enacted, etc.: That section 4 of "An act to regulate the manufacture, transportation, use and sale of explosives, and to punish an improper use of the same," approved June 16, 1887, in force July 1, 1887, be amended so as to read as follows:

SEC. 4. That no person, firm, company or corporation, shall make, manufacture or compound within the limits of this State, any dynamite, nitrochlorate, or other explosive compound within one-half ($\frac{1}{2}$) of a mile of any inhabited dwelling; and no person, firm, company or corporation shall make, manufacture or compound any dynamite, nitrochlorate or other explosive compound without a permit for such purpose signed by the county clerk of the county in which said manufacturing or compounding is desired to be done, and duly attested with the seal of said official, and the said official issuing the said permit shall keep a record of the names and residences of persons to whom such writ is issued. The officer authorized by this act shall not issue such permit unless the purpose for which said explosive or compound is to be manufactured is a lawful one. Any person, firm, company or corporation making any such compound without such permit, shall be guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine and imprisonment, or both, in the discretion of the court, such fine to be not less than two hundred dollars nor more than one thousand dollars, and for a second offense, shall be deemed guilty of a felony and be subject to imprisonment in the penitentiary for not less than one year nor more than five years, and a fine of not less than five hundred dollars nor more than two thousand dollars.

SECOND AMENDATORY ACT, 1903.

LAWS 1903, P. 159.

MAY 15, 1903.

AN ACT to amend section 4 of an act of the General Assembly of the State of Illinois, entitled "An Act to regulate the manufacture, transportation, use and sale of explosives, and to punish an improper use of the same," approved June 16, 1887, and in force July 1, 1887, and amended by an act of the General Assembly of the State of Illinois, approved May 28, 1889, and in force July 1, 1889.

SECTION 1. Be it enacted, etc.: That section 4 of an act of the General Assembly of the State of Illinois, entitled "An act to regulate the manufacture, transportation, use and sale of explosives, and to punish an improper use of the same," approved June 16, 1887, in force July 1, 1887, as amended by an act of the General Assembly of the State of Illinois, approved May 28, 1889, and in force July 1, 1889, be amended so that the same shall read as follows:

SEC. 4. That no person, firm, company or corporation shall make, manufacture or compound, within the limits of this State, any dynamite, nitro chlorate or other explosive compound within one-half ($\frac{1}{2}$) mile of any inhabited dwelling,

without first having obtained the consent in writing of a majority of the legal voters residing within a radius of one-half ($\frac{1}{2}$) mile of such place of making, manufacturing or compounding: Provided, that nothing in this section shall authorize the manufacture or compounding of any dynamite, nitro chlorate or other explosive within any incorporated city or village; and no person, firm, company or corporation shall make, manufacture or compound any dynamite, nitro chlorate or any other explosive compound without a permit for such purpose, signed by the county clerk of the county in which said manufacturing or compounding is desired to be done, duly attested with the seal of such official, and said county clerk shall issue such permit when the consent in writing is presented of a majority of the adult residents and legal voters residing within a radius of one-half ($\frac{1}{2}$) mile of such place of making and manufacturing, and filed with him, and the official issuing said permit shall keep a record of said permit and contents, and of the names and residences of the persons to whom such writ or permit is issued. The officer authorized by this act shall not issue such permit, unless the purpose for which such explosive or compound is to be manufactured, is a lawful one. Any person, firm, company or corporation making any such compound without such permit shall be guilty of a misdemeanor, and, upon conviction thereof, shall be subject to a fine and imprisonment in the county jail of not to exceed one year, or both, in the discretion of the court, such fine to be not less than two hundred dollars nor more than one thousand dollars and for a second offense shall be deemed guilty of a felony, and be subject to imprisonment in the penitentiary for not less than one year nor more than five years, and a fine of not less than five hundred dollars nor more than two thousand dollars.

THIRD AMENDATORY ACT, 1915.

LAWS 1915, P. 370.

JUNE 25, 1915.

AN ACT to amend section 4 of an Act of the General Assembly of the State of Illinois, entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 4 of an Act of the General Assembly of the State of Illinois, entitled "An Act to regulate the manufacture, transportation, use and sale of explosives, and to punish an improper use of the same," approved June 16, 1887, in force July 1, 1887, as amended by an Act of the General Assembly of the State of Illinois, approved May 28, 1889, and in force July 1, 1889, as amended by an Act of the General Assembly of the State of Illinois approved May 15, 1903, and in force July 1, 1903, so that the same shall read as follows*:

* NOTE.—This section as printed in the session laws of 1915 (p. 370) uses no words to show that the section referred to is amended. The usual words, "be and the same is hereby amended" are omitted.

SEC. 4. That no person, firm, company or corporation shall make, manufacture or compound, within the limits of this State, any dynamite, nitrochlorate or other explosive compound within one half ($\frac{1}{2}$) mile of any inhabited dwelling, without first having obtained the consent in writing of a majority of the legal voters residing within a radius of one-half ($\frac{1}{2}$) mile of such place of making, manufacturing or compounding: Provided, that nothing in this section shall authorize the manufacture or compounding of any dynamite, nitrochlorate or other explosive within any incorporated city or village, unless the incorporated city or village is created and organized since the location and construction of such explosive manufactory; and no person, firm, company or corporation shall make, manufacture or compound any dynamite, nitrochlorate or any other explosive compound without a permit for such purpose signed by the county

clerk of the county in which said manufacturing or compound is desired to be done, duly attested with the seal of such official, and said county clerk shall issue such permit when the consent in writing is presented, of a majority of the legal voters residing within a radius of one-half ($\frac{1}{2}$) mile of such place of making and manufacturing, and filed with him, and the official issuing said permit shall keep a record of said permit and contents and of the names and residences of the persons to whom such writ or permit is issued. The officer authorized by this act, shall not issue such permit unless the purpose for which such explosive or compound is to be manufactured is a lawful one. Any person, firm, company or corporation making any such compound without such permit shall be guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine and imprisonment in the county jail of not to exceed one year, or both in the discretion of the court, such fine to be not less than two hundred dollars nor more than one thousand dollars, and for a second offense shall be deemed guilty of a felony and be subject to imprisonment in the penitentiary for not less than one year nor more than five years, and a fine of not less than five hundred dollars nor more than two thousand dollars.

NOTE.—Section 4 of the original act of June 16, 1887, was first amended by the act of May 28, 1889. The same section was again amended by the act of May 15, 1903, and again amended by the act of June 25, 1915. Under familiar rules of constitutional law and statutory construction, an act that has been amended is functus officio and any second or subsequent act attempting to amend the original act after it has once been amended is void. Under this rule both the acts of May 15, 1903, and June 25, 1915, would be void. The question remains whether such an amendatory act is made valid by reciting in the title that the act amends a certain original act "as amended by an act of the General Assembly of the State of Illinois, approved," etc.

EXPLOSIVES—POWDER IN COAL MINE.

See Mining Operations, page 123.

Shot Firers, page 376.

LAWS 1903, P. 252.

MAY 14, 1903.

AN ACT concerning the use of powder in coal mines.

SECTION 1. Be it enacted, etc.: That, in all coal mines in this State, where coal is blasted, the quantity of powder used in the preparation of shots shall not in any case exceed sixty inches in coal seams five and one-half feet and over; and shall not exceed forty-eight inches in coal seams under five and one-half feet in thickness.

SEC. 2. For the purpose of determining the quantity of powder, prescribed in section 1 of this act, to be used in the preparation of any given shot, an inch of powder shall be one lineal inch, one and one-half inches in diameter, and it shall be measured in a metallic charger not to exceed twelve inches in length and one and one-half inches in diameter.

SEC. 3. No person shall drill or shoot what is known as a "dead" hole for any part of its depth; nor tamp any drill hole with drill dust, or other combustible material.

SEC. 4. Any violation of any of the conditions or requirements of this act shall be deemed a misdemeanor, punishable by a fine of not less than ten dollars (\$10) and not exceeding one hundred dollars (\$100), or by imprisonment in the county jail for a period not exceeding three months or both, at the discretion of the court.

SEC. 5. WHEREAS, An emergency exists, therefore, this act shall take effect and be in force from and after its passage and approval. (Repealed by Act of June 6, 1911. See page 212.)

AMENDATORY ACT, 1907.

LAWS 1907, P. 401.

MAY 24, 1907.

AN ACT to amend sections 1 and 2 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 1 and 2 of an Act entitled, "An Act concerning the use of powder in coal mines," approved and in force May 14, 1903, be, and the same are hereby amended to read as follows:

SEC. 1. That in all coal mines in this State, where coal is blasted, the quantity of the powder to be used in the preparation of shots shall not, in any case, exceed five (5) standard charges full of powder in coal seams five and one-half (5½) feet or over in thickness; and shall not, in any case, exceed four (4) standard charges full of powder in coal seams under five and one-half (5½) feet in thickness.

SEC. 2. For the purpose of determining the quantity of powder, prescribed in section 1 of this Act, to be used in the preparation of any given shot, a standard charger is defined and prescribed to be a cylindrical metallic charger not to exceed twelve (12) inches in length, and not to exceed one and one-half (1½) inches in diameter. (Repealed by Act of June 6, 1911. See page 229.)

EXPLOSIVES IN COAL MINES—BLACK POWDER.

LAWS 1911, P. 385.

JUNE 7, 1911.

AN ACT to promote the safety of persons and property in coal mines by regulating the character of black blasting powder sold to be used in coal mines.

SECTION 1. Be it enacted, etc.: That black powder for use for blasting in coal mines shall conform to the following specifications:

(a) It shall have a specific gravity of not less than 1.74 nor more than 1.90.
(b) It shall have a moisture content of not to exceed one per cent at the time when shipped by the manufacturer or his agent.

(c) Said powder shall be sold for use in coal mines only in seven sizes of granulation to be determined as follows:

CCC shall be powder which shall pass through a screen having round hole perforations of 40-64 of an inch in diameter and remain on a screen having round hole perforations of 32-64 of an inch in diameter.

CC shall be powder which shall pass through a screen having round hole perforations of 36-64 of an inch in diameter and remain on a screen having round hole perforations of 26-64 of an inch in diameter.

C shall be powder which shall pass through a screen having round hole perforations of 27-64 of an inch in diameter and remain on a screen having round hole perforations of 18-64 of an inch in diameter.

F shall be powder which shall pass through a screen having round hole perforations of 20-64 of an inch in diameter and remain on a screen having round hole perforations of 12-64 of an inch in diameter.

FF shall be powder which shall pass through a screen having round hole perforations of 14-64 of an inch in diameter and remain on a screen having round hole perforations of 7-64 of an inch in diameter.

FFF shall be powder which shall pass through a screen having round hole perforations of 9-64 of an inch in diameter and remain on a screen having round hole perforations of 2-64 of an inch in diameter.

FFFF shall be powder which shall pass through a screen having round hole perforations of 5-64 of an inch in diameter and remain on a screen having round hole perforations of 2-64 of an inch in diameter.

In testing powder for size of granulation as herein required, it shall be permissible for a given size to contain not to exceed $7\frac{1}{2}$ per cent by weight of grains of the size next larger and $7\frac{1}{2}$ by weight of grains of the size next smaller.

SEC. 2. All black powder sold for use in coal mines in this State shall have plainly stamped on the keg or package in which it is contained the letter showing the size of granulation according to the requirements of this Act.

SEC. 3. Any person, firm or corporation who shall sell for use in coal mines in this State any black powder not stamped as herein required, or who shall knowingly sell for use in coal mines in this State any powder which is untruthfully branded or stamped, and any person, firm or corporation being a manufacturer of black powder, or the agent of any such manufacturer of black powder, who shall sell for use in any coal mine in this State any powder which shall not conform to the requirements of this Act in respect to the specific gravity and moisture content shall be guilty of a misdemeanor, and shall be punishable by a fine of not exceeding \$100.00 or by imprisonment in the county jail for not exceeding ninety (90) days, or both, in the discretion of the court.

SEC. 4. (a) State mine inspectors and county mine inspectors shall have authority to sample black blasting powder used for blasting purposes in coal mines in this State, or kept on hand for sale or intended for shipment for use in such mines, and for such purposes they may enter upon the premises of any person.

(b) An inspector when sampling black blasting powder shall secure as accurate an average sample as is practicable, and shall test the granulation of such sample with screens provided for in this Act.

(c) If the inspector shall desire to have said sample tested for specific gravity or moisture content, he shall send the same to the State Mining Board for that purpose, and when such samples are intended to be tested for moisture content, they must be taken at the mill or warehouse of the manufacturer or manufacturer's agent, or in the railroad car for shipment at said mill or the warehouse; and said samples when so taken shall be immediately sealed moisture-proof before being sent to the State Mining Board.

When such samples are received by the State Mining Board they shall cause the same to be properly and accurately tested for specific gravity and for moisture content.

(d) If samples of powder when sampled and tested as provided in this Act shall be found not to comply with the provisions herein, the person, firm or corporation guilty of violating the provisions of this Act shall be prosecuted in accordance with the provisions hereof.

PERMISSIBLE EXPLOSIVES.

LAW 1913, P. 431.

JUNE 26, 1913.

AN ACT to promote the safety of persons and property in coal mines by regulating the character of permissible explosives sold to be used in coal mines.

SECTION 1. Be it enacted, etc.: That all permissible explosives for use in blasting coal in the State of Illinois shall conform to the following specifications:

(a) All permissible explosives offered for sale in the State of Illinois shall have printed on each cartridge and individual package the name of the manufacturer, the registered trade mark, brand, grade and a statement that it conforms in strength to that grade and brand established by the United States Bureau of Mines;

(b) Each shipping case shall have marked on it the total weight of explosives contained therein, and the average weight, length and diameter of each stick contained therein;

(c) Each shipping case containing permissible explosives shall be marked "Permissible Explosives."

(d) Each ingredient of a permissible explosive shall not vary more than the permitted variation established by the United States Bureau of Mines.

(2) State mine inspectors, county mine inspectors, and the accredited representatives of the coal operators and coal miners shall have authority to sample permissible explosives used for blasting purposes in coal mines in the State of Illinois, or kept on hand for sale, or intended for shipment for use in such mines, and for such purposes, they may enter upon the premises of any person, firm or corporation.

(3) If the State mine inspectors, county mine inspectors, or the accredited representatives of the coal operators or coal miners shall desire to have said sample tested for content, they shall send the same to the United States Bureau of Mines for that purpose.

(4) When such samples are intended to be tested for content, they must be taken at the mill or warehouse of the manufacturer or manufacturer's agent, or in the railroad car for shipment at said mill or warehouse or the magazine at the mine, and said samples shall be taken in accordance with the rules established by the United States Bureau of Mines.

(5) If samples of permissible explosives when tested as provided for in this Act shall be found not to comply with the provisions herein, the person, firm or corporation guilty of violating the provisions of this Act shall be prosecuted in accordance with the provisions hereof.

(6) Permissible explosives shall be stored in magazines constructed in accordance with plans that shall be approved by the State mine inspector of the district in which the mine is located.

(7) Every magazine shall be provided with a wooden floor which shall be kept free from grit and dirt. If more than one kind of explosive is kept in the same magazine, the magazine shall be divided into rooms by partitions; the different kinds of explosives shall be kept in different rooms, but no detonaters, or blasting caps, or any device containing fulminating composition shall be kept in the same magazine with any explosive. All detonaters, blasting caps or any device containing fulminating composition shall be kept separate in a safe and dry receptacle apart from any other explosive.

(8) Any person, firm or corporation changing any stamp, brand, or specification denoting the contents of any package or cartridge shall be subject to the penalties provided for herein.

(9) Any person, firm or corporation who shall sell for use in the coal mines in this State any permissible explosive not stamped as herein required, or who shall knowingly sell for use in coal mines in this State any permissible explosive which is untruthfully branded or stamped, and any person, firm or corporation being a manufacturer of permissible explosives, or the agent of any such manufacturer of permissible explosives, who shall sell for use in any coal mine in this State any permissible explosive which shall not conform to the requirements of this Act, shall be punishable by a fine of not exceeding one hundred dollars (\$100.00), or by imprisonment in the county jail for not exceeding ninety (90) days, or both, in the discretion of the court: Provided, that nothing in this Act shall be construed to apply to permissible explosives shipped prior to this Act taking effect.

GEOLOGIST—GEOLOGICAL SURVEY.

GEOLOGICAL SURVEY—RESOLUTION.

LAWS 1848-7, P. 176.

PREAMBLE AND RESOLUTION relative to the geological, mineralogical, and agricultural, resources of the State of Illinois.

WHEREAS, it is indisputable that for rich geological, mineralogical and agricultural resources, the State of Illinois is not surpassed by any State in the Union; and whereas, it is of vital importance to the future interest and prosperity of our State, that her latent resources be fully known and developed; and whereas, it has been represented that the persons named in the following resolution, in their deep interest in the prospective advantages to our State of such a demonstration to the world of her resources, are generously disposed to interest themselves in the advancement of such a result, free of charge; therefore, be it

Resolved by the House of Representatives, the Senate concurring herein, That A. Randall, Charles Whittlesey, John S. Wright, H. S. Cooley, and Francis Springer, be, and they are hereby appointed commissioners of the State of Illinois, to prepare and report to the Governor of the State of Illinois, on or before the first Monday in April, 1848, a statement of the propriety, advantages, etc., of a geological survey of this State: Provided, that no charge shall be made to this State for their services as said commissioners.

STATE GEOLOGIST.

LAWS 1851, P. 154.

FEBRUARY 17, 1851.

AN ACT for a geological and mineralogical survey of the State of Illinois.

SECTION 1. Be it enacted, etc.: That the governor, auditor and treasurer of the State are hereby authorized and required, as early as may be, to employ a geologist of known integrity and practical skill, for the purpose of making a geological and mineralogical survey of the entire territory of this State.

SEC. 2. It shall be the duty of said geologist to proceed, as soon as the necessary arrangements can be made, and with as much dispatch as may be consistent with minuteness and accuracy, to ascertain the order, succession, arrangement, relative position, dip and comparative magnitude of the several strata or geological formation within the State; to search for and examine all the beds and deposits of ores, coals, clays, marls, rocks and such other mineral substances as may present themselves, and to obtain chemical analysis of these substances, the elements of which are undetermined, and, by strict barometrical observations, to determine the relative elevations and depressions of the different parts of the State.

SEC. 3. It shall also be the duty of said geologist, during the time employed in the above work, to make annual reports of the progress and results of his labor, accompanied by such maps and drawings as may be deemed necessary, to illustrate the said reports; all of which shall be transmitted to the governor, in such condition that he may, without delay, cause them to be printed and circulated throughout the State, or wherever else he may desire to send them.

SEC. 4. It shall be the duty of said geologist to procure and preserve a full and entire suit of the different specimens found in the State, and cause them to be delivered to the secretary of state, who shall cause them to be properly arranged in a cabinet, and deposited in some apartment in or convenient to the capitol. Said suit shall be sufficiently large to furnish specimens to all institutions of learning within the State, empowered to confer degrees in the arts and sciences.

SEC. 5. The final reports of said geologist shall embody the results of the entire survey, and shall be accompanied by a geological map of the State, showing, by different colors and other marks and characters, the precise localities and extent of the different geological formations.

SEC. 6. For the purpose of carrying out and completing the said survey, the sum of not exceeding three thousand dollars is hereby placed at the disposal of the governor, to be applied to the payment of the said geologist, and such assistants as he may employ, by and with the consent of the governor, auditor and treasurer, and to defray the incidental expenses of the survey; which annual appropriation shall continue until the completion of said survey, or until its discontinuance be ordered by the legislature of this State.

SEC. 7. No money shall be paid to said geologist, or for the purpose of said survey, until the work shall be commenced.

SEC. 8. The said survey shall, if practicable, be commenced at the southern part of the State, and be proceeded with northerly. (Repealed February 28, 1867, Laws 1867, p. 10. P. 21.)

This act to take effect and be in force from and after its passage.

FIRST AMENDATORY ACT, 1853.

LAWS 1853, P. 237.

FEBRUARY 12, 1853.

AN ACT to amend an act entitled "An act for a geological and mineralogical survey of the State of Illinois." (Passed February 17, 1851.)

SECTION 1. Be it enacted, etc.: That the sum of five thousand dollars be and the same is hereby annually appropriated for the purpose of carrying out and completing the geological and mineralogical survey of the State of Illinois; and also the further sum of five hundred dollars per annum, for the purpose of furnishing accurate topographical maps of the several counties in the State, to be made out under the direction and superintendence of the State geologist. The said sums of money are hereby placed at the disposal of the governor, to be applied by him to the uses and purposes specified in this act, and the act to which this is an amendment.

This act to take effect and be in force from and after its passage.

SECOND AMENDATORY ACT, 1873.

LAWS 1873, P. 98.

APRIL 29, 1873.

LAWS 1873-74, P. 106.

APRIL 29, 1873.

AN ACT to amend an act entitled "An act for a geological and mineralogical survey of the State of Illinois," approved February 17, 1851.

SECTION 1. Be it enacted, etc.: That, section 4 of "An act for a geological and mineralogical survey of the State of Illinois," approved February 17, 1851, be and the same is hereby amended so as to read as follows:

SEC. 4. It shall be the duty of said geologist to procure and preserve a full and entire suit of the different specimens found in the State, and cause them to be delivered to the secretary of state, who shall cause them to be properly

arranged in a cabinet, and deposited in some apartment in or convenient to the capitol. Said suit shall be sufficiently large to furnish specimens to all institutions of learning within the State which are empowered to confer degrees in the arts or sciences, to the State normal schools, to the Industrial University at Champaign, and to all chartered institutions of science located in this State which publish their proceedings, and which keep up a regular system of exchanges with other like institutions.

GEOLOGIST—APPROPRIATIONS—REPORT (VOL. 3)—REPEALING ACT.

LAWS 1867, P. 10.

FEBRUARY 28, 1867.

AN ACT to increase the efficiency of the geological and mineralogical survey of the State.

SECTION 1. (Salary of State geologist \$3,000 and necessary traveling expenses.)

SEC. 2. (Additional appropriation of \$10,000 per annum to be expended under direction of State geologist.)

SEC. 3. (Appropriation of \$5,000 for the publishing of third volume of reports.)

SEC. 4. That section eight (8) of the act approved February, 1851, providing for a geological and mineralogical survey of the State, be, and the same is hereby repealed.

SEC. 5. This act shall be deemed a public act, and be in force from and after its passage.

APPROPRIATION—REPORT (VOL. 4).

LAWS 1869, P. 47.

MARCH 11, 1869.

AN ACT providing for the publication of the fourth volume of the report of the State geologist, and fixing his salary for the next two years.

SECTION 1. Be it enacted, etc.: That the publication of 3,000 copies of the fourth volume of the report of the State geologist is hereby authorized, and the sum of \$7,500 is hereby appropriated to defray the cost of engraving the necessary plates, maps, diagrams, and drawings; and, also, the further sum of \$1,500, to complete the necessary drawings for the fifth volume of said report;

* * * * *

SEC. 3. (Salary of State geologist to be \$3,000 per annum for two years.)

SEC. 4. (Distribution of reports.)

SEC. 5. This act shall be a public act, and take effect and be in force from and after its passage.

APPROPRIATION—REPORT (VOL. 5).

LAWS 1871-72, P. 166.

APRIL 3, 1872.

AN ACT providing for the Publication and Distribution of the Fifth Volume of the Report of the State geologist, and to fix the amount of his Salary until the Publication of the Sixth and Final Volume of said Report.

SECTION 1. (\$6,500 appropriated for publication of 3,000 copies of geologist's report.)

SEC. 2. (Providing for paper, printing, binding, etc.)

SEC. 3. (Providing for distribution by the secretary of state.)

SEC. 4. There shall be paid the State geologist the sum of \$2,000, as in full for his services and all expenses in superintending the publication of the said fifth volume, and finishing the sixth volume for publication, to be paid quarterly out of any money in the state treasury not otherwise appropriated.

APPROPRIATION—REPORT (VOL. 6).

LAWS 1873, P. 14.
LAWS 1873-4, P. 17.

APRIL 23, 1873.
APRIL 23, 1873.

AN ACT providing for the publication and distribution of the sixth volume of the report of the State geologist, to fix the amount of his salary, and provide for moving the State collection of geological specimens into the new State House.

SECTION 1. (Appropriation of \$7,500 for publication of sixth volume of State geologist's report.)

SEC. 2. (Providing for paper, printing, binding, etc.)

SEC. 3. (Authorizing secretary of state to distribute reports.)

SEC. 4. The state geologist is hereby required to move the state collection of geological specimens, now in the basement of the post-office building in this city, into the room prepared for its reception in the new state house, and the sum of one hundred and twenty-five dollars, or so much thereof as may be necessary, is hereby appropriated to defray the expense of removal.

SEC. 5. The salary of the State geologist shall be \$2,500 per annum, for two years from and after the first day of July, A. D. 1873, and his necessary office and traveling expenses, not to exceed \$600 per annum; and he shall be allowed the further sum of \$500 per annum, from said date, to defray the salary of an assistant, who shall be paid at that rate only for the time actually employed—all of which sums shall be payable quarterly; and he shall be allowed the further sum of \$1,500 for drawings for the sixth and final volume of his report; all of which sums are hereby appropriated.

APPROPRIATION—A. PAINE.

LAWS 1873-74, P. 18.

MARCH 26, 1874.

AN ACT making an appropriation for the payment of the claim of A. Paine, for binding the first and second volumes of the report of the Geological Survey of Illinois.

SECTION 1. (Providing for the appropriation of \$7,686.18 to pay the claim of A. Paine for binding the first and second volumes of the report of the geological survey of the State.)

APPROPRIATION—REPORT (VOL. 7).

LAWS 1881, P. 17.

MAY 26, 1881.

AN ACT to provide for the preparation and publication of the Illinois Geological Reports.

WHEREAS, the mineral resources of this State are of great value and importance, and their full development is deemed a matter of paramount interest to its future prosperity, and to this end it is necessary to collect and prepare for publication in some permanent form all such facts and information as can be obtained, from year to year, by personal examination of important localities by a competent geologist, and from experiments made by private parties with a drill, and by shafts for coal and other mineral products; and

WHEREAS, there is a great and increasing demand for the volumes of the geological reports already published; and

WHEREAS, the economical portion of said reports, relating especially to the mining and agricultural interests of this State, can be reproduced in three (3) royal octavo volumes of about five hundred and fifty (550) pages each, at a

cost not exceeding seventy-five (75) cents per copy for each volume; therefore,

SECTION 1. Be it enacted, etc.: That the curator of (the) State historical library and natural history museum, who is also required to perform such duties as may by law be required of the State geologist, shall, during the ensuing two years, collect and prepare for publication in a style conformable with the volumes of the geological survey already published, a volume with such maps, sections and plates as he may deem necessary to properly illustrate the same; this volume to be Vol. 7 of the geological survey of Illinois. Five thousand (5000) copies of said seventh volume, together with three thousand (3000) copies of each of the three (3) volumes comprising the economical portion of the six (6) volumes already published, to be printed by State authority under the law authorizing State printing and binding.

SEC. 2. (Distribution provided for.)

SEC. 3. Providing for appropriation of \$5,000 for salaries, etc., also \$5,000 for printing, binding, etc.

SEC. 4. Auditor of public accounts is authorized to draw his warrant for such amounts.

APPROPRIATION—REPORT (VOL. 8).

LAWS 1885, P. 30.

JUNE 27, 1885.

AN ACT to provide for the preparation and publication of volume 8, of the Geological Survey of Illinois.

SECTION 1. Be it enacted, etc.: That the curator of the State historical library and natural history museum, who is required to perform such duties as may by law be required of the State geologist, shall, during the ensuing two years, collect and prepare for publication, in a style conformable with the volumes of the geological survey already published, a volume with such maps, sections and plates as he may deem necessary to properly illustrate the same; this volume to be entitled "Volume 8, of the Geological Survey of Illinois;" five thousand copies of said volume to be printed and bound by State authority, under the law authorizing State printing and binding, the paper for the same to be furnished by the secretary of state, under the contract for printing paper and stationery, and the printing to be done in style of type and press work conformable with that of the preceding volumes, and acceptable to the said director.

SEC. 2. (Distribution.)

SEC. 3. For carrying out the provisions of this act the sum of five thousand dollars (\$5,000) per annum, is hereby appropriated, or so much thereof as may be required to prepare the said volume for publication, to pay the salaries of such assistants as may be required, for traveling and incidental expenses, and for drawing, engraving and printing such plates and sections as may be required to properly illustrate the volume.

SEC. 4. The auditor of public accounts is hereby authorized and required to draw his warrant on the State treasurer for the sum above named, on vouchers duly certified by the director of the work, and approved by the governor; and the State treasurer shall pay said amount out of the funds hereby appropriated.

GEOLOGICAL SURVEY IN UNIVERSITY.

REPEALED. SEE PAGE 439.

LAWS 1905, P. 30.

MAY 12, 1905.

AN ACT to establish and create, at the University of Illinois, the bureau to be known as a State Geological Survey, defining its duties and providing for the preparation and publication of its reports and maps to illustrate the natural resources of the State, and making appropriation therefor.

SECTION 1. Be it enacted, etc.: That there be and is hereby created and established at the University of Illinois a bureau, to be known as a State Geological Survey, which shall be under the direction of a commission, to be known as the State Geological Commission, composed of the governor (who shall be ex-officio chairman of the commission), the president of the University of Illinois and one other competent person to be appointed by the Governor, who shall hold office for the term of four years and until his successor is appointed and qualified.

SEC. 2. The said commissioners shall serve without compensation, but shall be reimbursed for actual expenses incurred in the performance of their official duties; and said commissioners shall have general charge of such bureau, and shall appoint a director, who may, with the approval of the board, appoint such assistants and employes as may be necessary to carry out the provisions of this act.

SEC. 3. The director appointed under the provisions of this act, and the assistants and employes appointed by him, as hereinbefore provided, shall receive such salaries or compensation as may be determined by the Board of Commissioners.

SEC. 4. The said bureau shall have for its objects and duties the following:

(1.) A study of the geological formations of the State with special reference to its products, i. e., coals, ores, clays, building stones, cement, materials suitable for use in the construction of roads, gas, mineral and artesian water and other mineral resources.

(2.) The preparation of geological and other necessary maps to illustrate the resources of the State.

(3.) The preparation of reports, with necessary illustrations and maps, which shall include both a general and detail description of the geological and mineral resources of the State.

(4.) The consideration of such other scientific and economic questions as in the judgment of the commissioners shall be deemed of value to the people.

SEC. 5. The regular and special reports of the said bureau shall be printed and distributed or sold, as the commissioners shall deem best for the interests of the people of the State, and as they may direct; and all moneys obtained by the sale of said reports shall be paid into the State treasury.

SEC. 6. The printing of said reports and of the necessary supplies of stationery, blank books and other printed matter necessary for the purposes of said bureau shall be and form a part of the State printing contract and as such be under the direction and supervision of the Board of Commissioners of State Contracts: Provided, however, that the cost thereof shall not exceed the sum of five thousand (\$5,000) dollars per annum.

SEC. 7. The directors shall present to the Governor an annual report showing the progress and condition of said bureau, together with such other information as the commissioners may deem necessary and useful.

SEC. 8. All materials collected after having served the purpose of the bureau, shall be distributed by the director to the educational institutions of the State in such manner as the commissioners may determine to be of the greatest ad-

vantage to the educational interests of the State, or, if deemed advisable, the whole or part of such material may be placed on permanent exhibition in the State Museum of Natural History at Springfield, or in the museums of the University of Illinois.

SEC. 9. The sum of twenty-five thousand (\$25,000) dollars per annum, or so much thereof as may be necessary, is hereby appropriated out of any money in the State treasury, not otherwise appropriated, to provide for the payment of actual expenses incurred by the said commissions [commissioners] in the performance of their official duties hereunder, and for other expenses or obligations authorized by them, and for the payment of the salary of the director appointed by said commissioners, and for the payment of the salaries or other compensation of the assistants and employes that may be appointed hereunder; and the Auditor of Public Accounts is hereby authorized and instructed to draw his warrant on the treasury for the allowance of said expenses and salaries upon the presentation of proper vouchers approved by the Governor.

SEC. 10. The said commissioners are hereby authorized to arrange with the director or the representative of the United States Geological Survey in regard to coöperation between the said United States Geological Survey and the said State Geological Commission in the preparation and completion of a contour topographic survey and map or maps of this State and said commission may accept or reject the work of said United States Geological Survey.

SEC. 11. In order to carry out the provisions of this Act it shall be lawful for any person or persons employed hereunder to enter and cross all lands within this State: Provided, that in so doing no damage is done to private property.

SEC. 12. The Commission may expend in the prosecution of such cooperative work a sum equal to that which shall be expended thereon by the United States Geological Survey: Provided, that not more than ten thousand (10,000) dollars be expended in this work in any one year. (Amended.)

SEC. 13. That it shall be the duty of the University of Illinois to give thorough and reliable instruction in the geology of clay-working materials, their origin, classification, physical and chemical properties, and their behavior under such influences as are met during the processes of manufacture, and to provide for this purpose such instructors, laboratories, apparatus and all illustrative material as may be necessary to make this instruction practical; and to carry out the provisions of this section there is hereby appropriated the sum of five thousand (5,000) dollars annually and the auditor of public accounts is hereby authorized to draw his warrants on the State Treasurer for the sum appropriated in this section upon order of the chairman of the Board of Trustees of the University of Illinois, countersigned by the secretary and with the corporate seal of the university.

SEC. 14. All previous enactments which conflict with the provisions of this act are hereby repealed. (Repealed.)

GEOLOGICAL COMMISSION—APPROPRIATION.

LAWS 1907-8, 17, P. 29 (ADJOURNED SESS.).

JUNE 4, 1907.

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

* * * * *

Sixty-fifth. State Geological Commission, \$25,000 per annum. For making survey of overflowed lands, \$15,000.

* * * * *

AMENDATORY ACT.**LAWS 1911, P. 517.****MAY 25, 1911.**

AN ACT to amend section 12 of an Act entitled "An Act, etc." (Same as in section 1.)

SECTION 1. Be it enacted, etc.: That section 12 of an Act entitled, "An Act to establish and create, at the University of Illinois, a bureau to be known as the State Geological Survey, defining its duties and providing for the preparation and publication of its reports and maps to illustrate the natural resources of the State, and making appropriation therefor," approved May 12, 1905, in force July 1, 1905, be and the same is hereby amended to read as follows:

SEC 12. The commission may expend in the prosecution of such cooperative work a sum equal to that which shall be expended thereon by the United States Geological Survey.

STATE GEOLOGICAL COMMISSION—APPROPRIATION.**LAWS 1911, 90, P. 107.****JUNE 10, 1911.**

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

SEC. 1. Be it enacted, etc.: That the following named sums, or so much thereof as may be necessary respectively for the purposes hereinafter named be and are hereby appropriated to meet the ordinary and contingent expenses of the State government.

* * * * *
Sixty-fifth. To the State Geological Commission for the support of and extension of the geological survey of the State, the sum of \$25,000 per annum.

For making a survey of the overflowed lands in Illinois \$7,500.

For study of the coal mining industry, accidents and wastes in cooperation with the United States Bureau of Mines and the University of Illinois, the sum of \$4,500 annually. (Preliminary arrangements already made.)

For preparing and engraving illustrations and maps and for binding and printing such reports of the survey, all printing contracts to be approved by the printer expert, the sum of \$2,500 per annum.

For maintenance and equipment for the School of Ceramics at the University of Illinois, \$15,000 per annum.

* * * * *

AMENDMENT.**LAWS 1911-12, 90, P. 37.****JUNE 6, 1912.**

AN ACT to amend section one (1) of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section one (1) of an Act entitled, "An Act to provide for the ordinary and contingent expenses of the State government, etc.," approved June 10, 1911, in force July 1, 1911, be and the same is hereby amended to read as follows:

SEC. 1. That the following named sums, be and are hereby appropriated to meet the ordinary and contingent expenses of the State government.

* * * * *

Sixty-fifth. To the State Geological Commission, \$25,000 per annum.

For making survey of overflowed lands \$7,500.

STATE GEOLOGICAL COMMISSION.

LAWS 1913, 95, P. 112.

JUNE 30, 1913.

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

SEC. 1. Be it enacted, etc.: That the following sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State government, etc:

*	*	*	*	*	*	*
Sixty-fifth. To the State Geological Commission, \$25,000.						
For making a survey of overflowed lands, \$7,500.						
*	*	*	*	*	*	*

MINE FIRE FIGHTING AND RESCUE STATION.

FIRE FIGHTING AND RESCUE STATIONS.

See Mine fire fighting equipment, page 33.

LAWS 1909-10, P. 2 (SPECIAL SESSION).

MARCH 4, 1910.

AN ACT to establish and maintain in the coal fields of Illinois mine fire fighting and rescue stations, and to make appropriation therefor.

SECTION 1. Be it enacted, etc.: That for the purpose of providing prompt and efficient means of fighting mine fires and of saving lives and property jeopardized by fires, explosions or other accidents in coal mines in Illinois, there shall be constructed, equipped and maintained at public expense three rescue stations to serve the northern, the central and the southern coal fields of the State.

SEC. 2. The Governor shall appoint a commission consisting of seven members, including two coal mine operators, two coal miners, one State mine inspector, one representative of the department of mining at the University of Illinois, and one representative of the federal organization for the investigation of mine accidents. Said commission shall, within ten days after their appointment, meet and organize by electing one of their number chairman and another secretary of said commission, who shall hold their respective offices for a period of one year from the date of their election and until their successors are elected and qualified. Members of the said commission not otherwise in the employ of the State or federal government shall receive ten dollars (\$10.00) per day for services rendered, not to exceed twenty-five (25) days during any one year, and all members of said commission shall be reimbursed for actual expenses while engaged in official work, approved by the commission; which commission shall be responsible for the proper carrying out of the provisions of this Act.

SEC. 3. The said commission shall provide or purchase or accept as a gift, suitably located sites for the stations, temporary and permanent quarters and suitable equipment and materials for the work: Provided, however, that the total cost of the equipment and maintenance of the service to July 1, 1911, shall not exceed seventy-five thousand (\$75,000) dollars. The said commission shall further arrange for coöperation in the work with mine owners, miners and State and federal organizations so as to render the service of the utmost efficiency.

SEC. 4. The State Architect shall, as provided by law, furnish plans and specifications for suitable buildings as required by said commission.

SEC. 5. The said commission shall appoint as manager of the three stations and of their work, a man experienced in mining and mine engineering. The manager shall, with the advice and consent of the said commission, appoint for each station a superintendent and an assistant. Each appointee shall serve for a term of two years and until his successor is appointed and qualified, unless sooner discharged by the said commission. Each appointee before entering upon the duties of his office shall take and subscribe to the oath of office as provided by law.

SEC. 6. The manager shall receive two hundred and fifty dollars (\$250) per month; each station superintendent one hundred and twenty-five dollars (\$125)

per month; and each appointee shall receive his necessary and actual traveling expenses while engaged in official duties.

SEC. 7. The manager shall, subject to approval of said commission, supervise the work at each of the three stations, shall purchase necessary supplies and shall file with the said commission, at the end of each quarter, a complete report of all operations and expenditures and an invoice of all supplies on hand. He shall provide that at each station some representative shall be on duty or within call at all hours of day and night for each day of the year.

SEC. 8. Whenever the manager or the superintendent of any station shall be notified by any responsible person that an explosion or accident requiring his services has occurred at any mine in the State, he shall proceed immediately with suitable equipment and on arrival at the said mine shall superintend the work of the rescue corps in saving life and property; and he shall cooperate with the management of the mine in rescue work, the said manager shall have authority over and may assume control of the mining property to such extent as is necessary for the protection of human life in the mine, during such time as members of the rescue corps are under ground, and while there is a reasonable expectation that men entombed in the mine may be alive.

SEC. 9. The commission shall prepare an annual report to the Governor and the General Assembly with necessary illustrations showing the work performed and money expended by the mine rescue service; and the State Board of Contracts is hereby directed to print and bind said reports promptly out of the appropriations for such board of contracts.

SEC. 10. To carry into effect the provisions of this Act, there is hereby appropriated the sum of seventy-five thousand dollars (\$75,000) of any money in the hands of the State Treasurer not otherwise appropriated; and the Auditor of Public Accounts is hereby directed to draw his warrants on the Treasurer on receipt of vouchers, properly certified by the chairman and secretary of said commission and approved by the Governor.

FIRST AMENDATORY ACT, 1911.

LAWS 1911, P. 494.

JUNE 5, 1911.

AN ACT to amend sections 2, 5 and 9 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 2, 5 and 9 of an Act entitled, "An Act to establish and maintain in the coal fields of Illinois, mine fire fighting and rescue stations, and to make an appropriation therefor," approved March 4, 1910, in force July 1, 1910, and the title thereto be and the same are hereby amended to read as follows:

SEC. 2. The Governor shall appoint a commission, consisting of seven members, including two coal mine operators, two coal miners, one State Mine Inspector, one representative of the department of mining at the University of Illinois, and one representative of the Federal Bureau of Mines. Said commission shall, within ten days after their appointment, meet and organize by selecting one of their number chairman and another secretary of said commission, who shall hold their respective offices for a period of one year from the date of their election and until their successors are elected and qualified. Members of the said commission shall receive ten dollars (\$10.00) per day for services rendered, not to exceed twenty-five (25) days during any one year, and all members of said commission shall be reimbursed for actual expenses while engaged in official work, approved by the commission; which commission shall be responsible for the proper carrying out of the provisions of this Act.

SEC. 5. The said commission shall appoint as manager of three stations and of their work, a man experienced in mining and mine engineering. The manager

shall, with the advice and consent of the said commission, appoint for each station a superintendent and an assistant. Each appointee shall serve for a term of two years and until his successor is appointed and qualified, unless sooner discharged by the said commission. Each appointee before entering upon the duties of his office shall take and subscribe to the oath of office as provided by law. The manager shall with the advice and consent of the commission, have authority to pay for such temporary assistance as may be needed in giving instruction in first aid to the injured and similar technical subjects, and such other temporary assistants and porters as may be needed from time to time to properly carry on the work of said rescue stations and such rescue cars as may be installed in connection with said stations, but not more than one extra assistant and one porter shall be employed for each rescue car.

SEC. 9. The commission shall prepare a biennial report to the Governor and the General Assembly with necessary illustrations showing the work performed and money expended by the mine rescue service; and the State Board of Contracts is hereby directed to print and bind said reports promptly, and to provide all necessary printing for the Mine Rescue Commission out of the appropriations for such board of contracts.

SEC. 2. The title of said Act shall be amended to read as follows:

An act to establish and maintain in the coal fields of Illinois mine fire fighting and rescue stations.

SECOND AMENDATORY ACT, 1913.

LAWS 1913, P. 433.

JUNE 27, 1913.

AN ACT to amend sections 5, 6, 8 and 9 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 5, 6, 8 and 9 of an Act entitled, "An Act to establish and maintain in the coal fields of Illinois mine fire fighting and rescue stations," approved March 4, 1910, in force July 1, 1910, title as amended by Act approved June 5, 1911, in force July 1, 1911, be and the same are amended to read as follows:

SEC. 5. The said commission shall appoint as manager of three stations and of their work, a man experienced in mining and mine engineering. The manager shall, with the advice and consent of the said commission, appoint for each station a superintendent and an assistant. Each appointee shall serve for a term of two years and until his successor is appointed and qualified, unless sooner discharged by the said commission. Each appointee before entering upon the duties of his office shall take and subscribe to the oath of office as provided by law. The manager shall, with the advice and consent of the commission, have authority to pay for such assistants as may be needed in giving instruction in first aid to the injured and similar technical subjects, and such other assistants and porters as may be needed from time to time to properly carry on the work of said rescue stations and such rescue cars as may be installed in connection with said stations, but not more than two extra assistants and one porter shall be employed for each rescue car.

SEC. 6. The manager shall receive two hundred and fifty dollars per month; each station superintendent one hundred and twenty-five dollars per month; and each station assistant one hundred dollars per month; and each appointee shall receive his necessary and actual expenses.

SEC. 8. Whenever the manager or the superintendent of any station shall be notified by any responsible person that an explosion or accident requiring his services has occurred at any mine in the State, he shall proceed immediately

with suitable equipment and on arrival at the said mine shall superintend the work of the rescue corps in saving life and property; and he shall cooperate with the State Mine Inspector and the management of the mine in rescue work to such extent as is necessary for the protection of human life in the mine, during such time as members of the rescue corps are under ground and while there is a reasonable expectation that men entombed in the mine may be alive.

SEC. 9. The commission shall prepare a biennial report to the Governor and the General Assembly with necessary illustrations showing the work performed and money expended by the mine rescue service; and the State Board of Contracts is hereby directed to print and bind said reports promptly, and to provide all necessary printing for the Mine Rescue Commission out of the appropriations for such board of contracts.

The Secretary of State shall assign to the use of the commission, suitably furnished rooms in the State House, and shall also furnish whatever blanks, blank books, printing, stationery, instruments and supplies the commission may require in the discharge of its duties and for use of its employees.

THIRD AMENDATORY ACT, 1915.

LAWS 1915, P. 587.

JUNE 23, 1915.

AN ACT to amend sections 5, 6, 7 and 8 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 5, 6, 7 and 8 of an Act entitled, "An Act to establish and maintain in the coal fields of Illinois, mine fire fighting and rescue stations," approved March 4, 1910, and in force July 1, 1910, title as amended by Act approved June 5, 1911, in force July 1, 1913, be amended so as to read as follows:

SEC. 5. The said commission shall appoint for each station a superintendent and assistant. Each appointee shall serve for a term of two years and until his successor is appointed and qualified, unless sooner discharged by the said commission. Each appointee before entering upon the duties of his office shall take and subscribe to the oath of office as provided by law. The commission shall have authority to pay for such assistants as may be needed in giving instruction in first aid to the injured and similar technical subjects, and such other assistants as may be needed from time to time to properly carry on the work of said rescue stations and such rescue cars and substations as may be installed in connection with said stations, but not more than two extra assistants shall be employed for each rescue car.

SEC. 6. Each station superintendent shall receive one hundred and twenty-five dollars per month; and each station assistant one hundred dollars per month; and each appointee shall receive his necessary and actual expenses.

SEC. 7. The said commission shall supervise the work at each of the three stations, shall purchase necessary supplies, and shall keep a complete record of all operations and expenditures and an invoice of all supplies on hand. The commission shall provide that at each station some representative shall be on duty or within call at all hours of day and night for each day of the year.

SEC. 8. Whenever the superintendent of any station shall be notified by any responsible person that an explosion or accident requiring his services has occurred at any mine in the State, he shall proceed immediately with suitable equipment and on arrival at the said mine shall superintend the work of the rescue corps in saving life and property; and he shall cooperate with the State Mine Inspector and the management of the mine in rescue work to such extent as is necessary for the protection of human life in the mine, during

such time as members of the rescue corps are under ground and while there is a reasonable expectation that men entombed in the mine may be alive.

MINE RESCUE STATIONS—APPROPRIATION.

LAWS 1911-12, 30, P. 40.

JUNE 6, 1912.

AN ACT To amend section one (1) of an Act entitled, "An Act, etc." (same as in section 1).

SECTION 1. Be it enacted, etc.: That section one (1) of an Act entitled, "An Act to provide for the ordinary and contingent expenses of the State Government, etc.," approved June 10, 1911, in force July 1, 1911, be, and the same is hereby, amended to read as follows:

SEC. 1. That the following-named sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc.

* * * * *

Eighty-first. To the Mine Rescue Station Commission: For equipment and maintenance of mine-rescue stations and mine-rescue cars, and other expenses, the sum of \$30,000 per annum.

* * * * *

APPROPRIATION.

LAWS 1913, 95, P. 116.

JUNE 30, 1913.

AN ACT To provide for the ordinary and contingent expenses of the State Government, etc.

SEC. 1. Be it enacted, etc.: That the following sums, be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc.

* * * * *

Eighty-first. To the Mine Rescue Station Commission: \$35,000 per annum.

* * * * *

MINE FIRE FIGHTING EQUIPMENT.

FIRE FIGHTING EQUIPMENT.

See Mine fire fighting and rescue stations, page 28.

(Amended. See page 440.)

LAWS 1900-10, P. 24.

MARCH 3, 1910.

AN ACT to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines.

SECTION 1. Be it enacted, etc.: On and after July 1, 1910, except as herein-after in section 6 of this Act is provided, the following requirements for fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines shall be strictly observed by all persons, firms, corporations or associations maintaining and operating a coal mine within the State of Illinois.

Sec. 2. There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe, tank or pond. Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passage-ways leading from the bottom of each of said shafts to such extent and in such position that with one (1) fifty foot length of hose the water may be carried into all such entries and passage ways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines, such area to be designated in this Act as the fire protected area: Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half ($1\frac{1}{2}$) inch inside diameter linen hose or rubber lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and the connections therefor on the supply pipes shall have American Standard iron pipe threads. The nozzles on such hose shall be not less than three-eighths ($\frac{3}{8}$) nor more than five-eighths ($\frac{5}{8}$) inch in diameter.

Where any part of any passage way or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less than one and one-half ($1\frac{1}{2}$) inch pipes connected with the fire-fighting

water supply, and such sprinklers shall not be more than ten (10) feet apart. In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid and there shall be one such sprinkler for each eight (8) feet square of horizontal area of such cribbing or lagging.

In every underground stable, located within one thousand (1000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall be not less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire fighting water supply.

All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall be not less than two (2) barrels full of water and two (2) metal pails with each barrel in each entry or passage way into which such stable opens and not more than fifty (50) feet from the opening of the stable. There shall also be one (1) not less than three (3) gallon chemical fire extinguisher and two (2) not less than six (6) gallon hand pump buckets in each such stable and in each entry or passage way into which such stable opens not more than fifty (50) feet from the opening of such stable. Such chemical fire extinguishers and hand pump buckets shall be kept filled and ready for use: Provided, however, that in coal mines in which less than ten (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine, barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) gallons capacity and not less than six (6) chemical fire extinguishers of not less than three (3) gallons capacity, and said extinguishers and buckets shall be kept filled and ready for use.

A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

All mines shall have at least one, not less than three (3) gallon chemical fire extinguishers (extinguisher) and one not less than six (6) gallon hand pump bucket including those hereinbefore in this Act required, for each fifty (50) employes in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and such extinguishers and buckets shall be kept filled and ready for use. (Amended. See page 440.)

Sec. 3. During the cold weather months the water pipes shall be kept drained, but the supply must be kept so that by opening a valve easily accessible on top, the water will be promptly available at all times in the supply pipes underground. The water pressure in said pipes to which hose is to be connected shall not be less than twenty-four (24) pounds per square inch, nor more than seventy (70) pounds per square inch at a point not less than two hundred and fifty (250) feet from the bottom of the shaft or the corresponding position in slopes and drifts; and there shall be a pressure gauge with dial at said point.

When the water pressure in the pipes leading into the mine is higher than seventy (70) pounds per square inch at the pressure gauge, there shall be a valve on the incoming supply pipe to control the pressure into the branch pipes in the mine, and there shall be a shut-off valve on every branch pipe at the connection of such pipe with the pipe from which it leads.

Sec. 4. No underground stable, unless so constructed as to be fire-proof throughout, shall be nearer than six (6) yards to any regular traveling way and every underground stable shall have at each opening a fire-proof door with a door-frame of concrete, stone or brick laid in mortar.

Every such stable, which contains more than ten (10) stalls, shall have a cement or brick partition, with a fire-proof door therein, for each ten (10) stalls or less; or, in lieu of said partition, the stable shall be lined with cement plaster on wire lathing or other fire-proof material, where inflammable material is exposed.

All hay, bedding and feed underground, except that in the mangers and stalls, shall be kept in a closed cement, brick, stone or metal receptacle; and not more than forty-eight (48) hours' supply of hay or bedding shall be kept underground, and not more than one week's supply of grain.

All hay and bedding taken into the mine shall be baled. Hay, bedding and feed shall be taken into the mine only in a closed car or box, which shall be kept closed until the materials are removed to the receptacles provided therefor.

No open light shall be taken into an underground stable by any person.

Sec. 5. There shall be a system of party line telephones which shall include one telephone on the surface not more than one hundred (100) feet from the tippie, and one at the bottom of the hoisting shaft, or, in slope or drift mines, at the first cross entries in operation; and, in addition thereto, there shall be one telephone on each side of the mine (when) such side is in more than one thousand (1,000) feet from the bottom of the hoisting shaft, or is in one thousand (1,000) feet beyond the first cross entries in operation in slope or drift mines; and, in addition thereto, there shall be one telephone for each one hundred (100) employees, or major fraction thereof in excess of one hundred (100) employees in said mine.

There shall be no (an) electric gong signal system actuated by an electric generator current and operated from the bottom of the hoisting shaft or from the tippie in slope or drift mines. The wires shall be of not less carrying capacity than No. 12 iron wire. The gongs shall be not less than eight (8) inches in diameter. Only non-sparking bells shall be used.

In pillar and room mines there shall be a gong in one entry of each pair of entries, not more than two hundred and fifty (250) feet from the face of said entry. In long wall mines there shall be one gong on each main heading in operation not more than two hundred and fifty (250) feet from the face, and, in addition thereto, there shall be gongs on cross roads in operation off of main headings so there shall be one gong for not more than one thousand (1,000) feet of working face in operation.

In the system of signals one long ring on said electric gong shall signify "Danger, men go to the hoisting shaft;" a succession of short rings shall signify "Danger, men go to the escapement shaft." It shall be the special duty of all drivers, motormen and trip riders to notify all other drivers, motormen, trip riders or miners from whom they haul coal; and it shall be the duty of every person in the mine receiving such danger signal to cooperate in giving notice thereof to all other persons in the mine.

There shall be attached to every cage on which men are or may be hoisted or lowered, a horn or other device from which signals can be given on the cage.

Certain employes whose regular work is in or near the fire protected areas shall have graded authority and designated duties in case of fire; and rules and instructions therefor shall be included in the regular rules of the mine, and such employes shall be instructed therein by the mine manager. There shall be a fire drill of such employes not less often than once in two weeks, and the pipes, connections, hose and electric signals shall be tested at such drills.

SEC. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act:

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or draft mines, shall be of fire-proof construction, except that cage guides may be wood: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof of the passage ways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be constructed of fire-proof material and only fire-proof materials shall be used in the walls, except that the coal rib or pillar may be used as a wall in such passage ways.

(c) All underground stables and the opening therein shall be constructed of fire proof material throughout.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire fighting equipment described in section 2, and the electric gongs and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than three (3) gallon chemical fire extinguisher and one not less than six (6) gallon hand pump bucket, for each fifty (50) employes in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use.

In mines constructed in accordance with the provisions of this section 6, in addition to the telephone (telephones) required by this Act to be installed inside of the mine, there shall be one (1) gong not less than twelve (12) inches in diameter with non-sparking bell, located near each telephone inside the mine, actuated by electric generator current operated from the bottom of the hoisting shaft or from the tippie in slope and drift mines. On becoming aware of any serious danger requiring the inside employes to come out of the mine, it shall be the duty of the person having charge of the outside telephone immediately to ring the danger signal on the gongs and it shall be the duty of all persons who hear such signal or receive information thereof to cooperate in giving notice thereof to all other persons in the mine. (Amended. See page 440.)

SEC. 7. Any willful neglect, refusal or failure to obey the requirements or provisions of this Act, or willfully giving a false danger signal or tampering with any of the appliances required by the provisions of this Act, shall be deemed a misdemeanor, punishable by a fine of not less than fifty dollars (\$50) and not to exceed two hundred (Dollars) (\$200), or by imprisonment in the county jail for a period not exceeding three (3) months, or both, in the discretion of the court.

Upon final conviction of any mine manager or any miner, under the provisions of this Act, his certificate of competency shall be thereby invalidated; and it shall be the duty of the State Mining Board in the case of a mine manager of the miners' examining board which shall have issued such certificate in the case of a minor, (miner) to cancel and revoke the certificate of

competency of the person so convicted; and such person shall not be entitled to receive another certificate of competency within three (3) months from the date of such cancellation and revocation.

For the purpose of securing an efficient enforcement of this Act, each State Mine Inspector shall make a written request upon the county board of supervisors or of commissioners in counties not under township organization, for each county in which coal is produced, for the appointment of a county mine inspector. Every State Mine Inspector shall authorize, in writing each county mine inspector within his district to assume and discharge all the powers of a State Mine Inspector in said county, with respect to compliance with the provisions of this Act. Every county mine inspector shall devote as much of his time as may be necessary to inspecting the mines in his county with a view to ascertaining whether the provisions of this Act are being complied with; and no county board shall limit the time which a county mine inspector may devote to a proper compliance with this provision, but this provision shall not be held to lessen the duty of a state mine inspector under the general mining law of the State.

If any county mine inspector shall find that any provision of this Act is being violated, it shall be his duty to file a sworn complaint before any court of competent jurisdiction, stating the facts within his knowledge in such case and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's Attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

Each county mine inspector shall report at least once a month to the State Mine Inspector for the district in which such county is located, stating the mines he has examined, the violations of this Act which he has discovered and the complaints he has filed under the provisions of this Act.

If the county mine inspector shall fail to file a complaint, as herein required, of a violation of this Act which he shall have reported to the State Mine Inspector, in all other cases of violation of this Act which shall have come to the knowledge of a State Mine Inspector in the discharge of his duties, it shall be the duty of such State Mine Inspector to file a sworn complaint before any court of competent jurisdiction, stating the facts reported to him by the county mine inspector, or coming to his knowledge in the discharge of his duties, and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

If any State Mine Inspector or any county mine inspector shall willfully fail, neglect or refuse to file a complaint as herein required, or shall willfully disregard the duties required of him by the provisions of this Act, a sworn complaint may be filed by any person having knowledge of the facts, before any court of competent jurisdiction, charging said county mine inspector or said State Mine Inspector, as the case may be, with nonfeasance in office and asking that such inspector be bound over to the next grand jury for said county, and the State's Attorney for the county in which such violation occurs shall prosecute such complaint as provided by law in other State cases.

Upon final conviction for nonfeasance in office under the provisions of this Act, of any State Mine Inspector or any county mine inspector, his certificate of qualification or of competency, as the case may be, shall be thereby invalidated and he shall become disqualified from holding such office, and such person shall not be entitled to receive another certificate of qualification or of

competency, as the case may be, within three (3) months from the date of such final conviction.

SEC. 8. Whereas, An emergency exists; therefore, this Act shall be in force and effect from and after its passage.

FIRST AMENDATORY ACT, 1911.

LAWS 1911, P. 419.

JUNE 7, 1911.

AN ACT to amend sections, 2, 4, 5, 6, and 7 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved March 8, 1910, in force March 8, 1910.

SECTION 1. Be it enacted, etc.: That sections 2, 4, 5, 6 and 7 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved March 8, 1910, in force March 8, 1910, be and the same are amended to read as follows:

SEC. 2. (a) There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe, tank or pond.

(b) Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passageways leading from the bottom of each of said shafts to such extent and in such position that with one (1) fifty foot length of hose the water may be carried into all such entries and passage ways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines such area to be designated in this Act as the fire protected area.

(c) Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

(d) There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half (1½) inch inside diameter linen hose or rubber-lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and the connections therefor on the supply pipes shall have American Standard iron pipe threads. The nozzles on such (hose) shall be not less than three-eighths (¾) nor more than five-eighths (⅝) inch in diameter.

(e) Where any part of any passageway or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less than one and one half (1½) inch pipes connected with the fire fighting water supply, and such sprinklers shall not be more than ten (10) feet apart.

(f) In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid and there shall be one such sprinkler for each eight (8) feet square of horizontal area of such cribbing or lagging.

(g) In every underground stable, located within one thousand (1,000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall be not less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic water sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire fighting water supply.

(h) All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

(i) In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall be not less than two (2) barrels full of water and two (2) metal pails with each barrel in each entry or passageway into which such stable opens and not more than fifty (50) feet from the opening of the stable.

(j) There shall also be one (1) not less than three (3) gallon chemical fire extinguishers and two (2) not less than (6) gallon handpump buckets in each stable and in each entry or passageway into which such stable opens not more than fifty (50) feet from the opening of such stable: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required. Such chemical fire extinguishers and hand-pump buckets shall be kept filled and ready for use.

(k) Provided, however, that in coal mines in which less than ten (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine, barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) hand-pump buckets of not less than six (6) gallons capacity, and said buckets shall be kept filled and ready for use.

(l) A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

(m) All mines shall have at least one, not less than (3) gallon chemical fire extinguisher, and one not less than six (6) gallon hand-pump bucket, including those hereinbefore in this Act required, for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

Sec. 4. (a) No underground stable, unless so constructed as to be fire-proof throughout, shall be nearer than six (6) yards to any regular traveling way, and every underground stable shall have at each opening a fireproof door with a door frame of concrete, stone or brick laid in mortar.

(b) Every such stable, which contains more than ten (10) stalls, shall have a cement or brick partition, with a fireproof door therein, for each ten (10) stalls or less; or, in lieu of said partition, the stable shall be lined with cement

plaster or wire lathing or other fireproof material, where inflammable material is exposed.

(c) All hay, bedding and feed underground, except that in the manger and stalls, shall be kept in a closed cement, brick, stone or metal receptacle; and not more than forty-eight (48) hours' supply of hay or bedding shall be kept underground, and not more than one week's supply of grain.

(d) All hay and bedding taken into the mine shall be baled. Hay, bedding and feed shall be taken into the mine only in a closed car or box, which shall be kept closed until the materials are removed to the receptacles provided therefor.

(e) No light with an unprotected flame shall be taken into an underground stable by any person.

SEC. 5. (a) There shall be a system of party line telephones which shall include one telephone on the surface not more than two hundred (200) feet from the tippie, and one at the bottom of the hoisting shaft, or, in slope or drift mines at the first cross entries in operation; and, in addition thereto, there shall be one telephone at each inside parting. Telephone lines shall be constructed in a workmanlike manner and shall be repaired promptly when necessary.

(b) On becoming aware of any serious danger requiring the inside employees to come out of the mine, it shall be the duty of the person having charge of the outside or inside telephone immediately to give notice of the danger to the other telephone stations; and it shall be the duty of all persons who receive information thereof to cooperate in giving notice thereof to all other persons in the mine. It shall be the special duty of all drivers, motormen and trip riders to notify all other drivers, motormen, trip riders or miners from whom they haul coal, of any danger requiring them to leave the mine.

(c) Certain employees whose regular work is in or near the fire protected areas shall have graded authority and designated duties in case of fire; and rules and instructions therefor shall be included in the regular rules of the mine, and such employees shall be instructed therein by the mine manager.

(d) There shall be a fire drill of such employees not less often than once in two weeks, and the pipes, connections and hose shall be tested at such drills.

SEC. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act: Provided, that paragraph(s) (a) and (b) shall not apply to mines where ten (10) men or less are employed.

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or drift mines, shall be of fireproof construction, except that cage guides may be wood: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof and walls of the passageways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be of fireproof construction, except that the coal rib or pillar may be used as a wall in such passageways.

(c) All underground stables and the openings therein shall be of fireproof construction.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire fighting equipment described in section 2, and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than three (3) gallon chemical fire extinguisher and one not less than six (6) gallon hand-pump bucket, for each fifty (50) employees

in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

SEC. 7. (a) Any wilful neglect, refusal or failure to obey the requirements or provisions of this Act, or wilfully giving a false danger signal or tampering with any of the appliances required by the provisions of this Act, shall be deemed a misdemeanor, punishable by a fine of not less than fifty dollars (\$50) and not to exceed two hundred dollars (\$200), or by imprisonment in the county jail for a period not exceeding three (3) months, or both, in the discretion of the court.

(b) Upon final conviction of any mine manager or any miner, under the provisions of this Act, his certificate of competency shall be thereby invalidated; and it shall be the duty of the State Mining Board in the case of a mine manager of the miners' examining board which shall have issued such certificate in the case of a miner, to cancel and revoke the certificate of competency of the person so convicted; and such person shall not be entitled to receive another certificate of competency within three (3) months from the date of such cancellation and revocation.

(c) If any State Mine Inspector, or any county mine inspector shall find that any provision of this Act is being violated, it shall be his duty to file a sworn complaint before any court of competent jurisdiction, stating the facts within his knowledge in such case and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

Each county mine inspector shall report at least once a month to the State Mine Inspector for the district in which said county (mine inspector) is working, stating the mines he has examined, the violations of this Act which he has discovered and the complaints he has filed under the provisions of this Act.

(d) If the county mine inspector shall fail to file a complaint, as herein required, of a violation of this Act which he shall have reported to the State Mine Inspector, and in all other cases of violation of this Act which shall have come to the knowledge of a State Mine Inspector in the discharge of his duties it shall be the duty of such State Mine Inspector to file a sworn complaint before any court of competent jurisdiction, stating the facts reported to him by the county mine inspector, or coming to his knowledge in the discharge of his duties, and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

(e) If any State Mine Inspector or any county mine inspector shall wilfully fail, neglect or refuse to file a complaint as herein required, or shall wilfully disregard the duties required of him by the provisions of this Act, a sworn complaint may be filed by any person having knowledge of the facts, before any court of competent jurisdiction, charging said county mine inspector or said State Mine Inspector, as the case may be, with nonfeasance in office and asking that such inspector be bound over to the next grand jury for said county, and the State's attorney for the county in which such violation occurs shall prosecute such complaint as provided by law in other State cases.

Upon final conviction for nonfeasance in office under the provisions of this Act, of any State Mine Inspector or any county mine inspector, his certificate of qualification or of competency, as the case may be, shall be thereby invalidated and he shall become disqualified from holding such office, and such

person shall not be entitled to receive another certificate of qualification or of competency, as the case may be, within three (8) months from the date of such final conviction.

(SEC. 2.) SEC. 8. Whereas an emergency exists, therefore, this Act shall be in force and effect from and after its passage.

SECOND AMENDATORY ACT, 1913.

LAWS 1913, P. 484.

JUNE 26, 1913.

AN ACT to amend sections 2 and 6 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 2 and 6 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved and in force March 8, 1910, as amended by Act approved and in force June 7, 1911, be and the same are hereby amended so as to read as follows:

SEC. 2. (a) There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe, tank or pond.

(b) Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passageways leading from the bottom of each of said shafts to such extent and such position that with one (1) fifty foot length of hose the water may be carried into all such entries and passageways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines, such area to be designated in this Act as the fire protected area;

(c) Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

(d) There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half (1½) inch inside diameter linen hose or rubber-lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and connections therefor on the supply pipes shall have American standard iron pipe threads. The nozzles on such hose shall be not less than three-eighths (¾) nor more than five-eighths (⅝) inch in diameter.

(e) Where any part of any passageway or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less than one and one-half (1½) inch pipes connected with the fire

fighting water supply, and such sprinklers shall not be more than ten (10) feet apart.

(f) In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid and there shall be one such sprinkler for each eight (8) feet square or horizontal area of such cribbing or lagging.

(g) In every underground stable, located within one thousand (1,000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall not be less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire fighting water supply.

(h) All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

(i) In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall not be less than two (2) barrels full of water and two (2) metal pails with each barrel in each entry or passageway into which such stable opens and not more than fifty (50) feet from the opening of the stable.

(j) There shall also be one (1) not less than three (3) gallons chemical fire extinguishers and two (2) not less than six (6) gallon hand-pump buckets in each stable and in each entry or passageway into which such stable opens not more than fifty (50) feet from the opening of such stable: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required. Such chemical fire extinguishers and hand-pump buckets shall be kept filled and ready for use.

(k) Provided, however, that in coal mines in which less than (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine, barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) hand-pump buckets of not less than six (6) gallons capacity, and said buckets shall be kept filled and ready for use.

(l) A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

(m) All mines shall have at least one, not less than three (3) gallon chemical fire extinguisher, and one not less than six (6) gallon hand-pump bucket, including those hereinbefore in this Act required, for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and three (3) fire extinguishers of three (3) gallons each in each building located within one hundred (100) feet of any shaft, drift or slope, and such extinguishers shall be recharged once every six months and a record made of the date of recharging in the mine examiner's report book: Provided, this does not apply to buildings constructed of fire proof material. Such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

Certain employes whose regular work is in or near the fire protected areas shall have graded authority and designated duties in case of fire; and rules and instructions therefor shall be included in the regular rules of the mine, and such employes shall be instructed therein by the mine manager. There shall be a fire drill of such employes not less often than once in two weeks, and the pipes, connections, hose and electric signals shall be tested at such drills.

SEC. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act:

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or draft mines, shall be of fire-proof construction, except that cage guides may be wood: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof of the passage ways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be constructed of fire-proof material and only fire-proof materials shall be used in the walls, except that the coal rib or pillar may be used as a wall in such passage ways.

(c) All underground stables and the opening therein shall be constructed of fire proof material throughout.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire fighting equipment described in section 2, and the electric gongs and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than three (3) gallon chemical fire extinguisher and one not less than six (6) gallon hand pump bucket, for each fifty (50) employes in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use.

In mines constructed in accordance with the provisions of this section 6, in addition to the telephone (telephones) required by this Act to be installed inside of the mine, there shall be one (1) gong not less than twelve (12) inches in diameter with non-sparking bell, located near each telephone inside the mine, actuated by electric generator current operated from the bottom of the hoisting shaft or from the tippie in slope and drift mines. On becoming aware of any serious danger requiring the inside employes to come out of the mine, it shall be the duty of the person having charge of the outside telephone immediately to ring the danger signal on the gongs and it shall be the duty of all persons who hear such signal or receive information thereof to cooperate in giving notice thereof to all other persons in the mine. (Amended. See page 440.)

SEC. 7. Any wilful neglect, refusal or failure to obey the requirements or provisions of this Act, or willfully giving a false danger signal or tampering with any of the appliances required by the provisions of this Act, shall be deemed a misdemeanor, punishable by a fine of not less than fifty dollars (\$50) and not to exceed two hundred (Dollars) (\$200), or by imprisonment in the county jail for a period not exceeding three (3) months, or both, in the discretion of the court.

Upon final conviction of any mine manager or any miner, under the provisions of this Act, his certificate of competency shall be thereby invalidated; and it shall be the duty of the State Mining Board in the case of a mine manager of the miners' examining board which shall have issued such certificate in the case of a minor, (miner) to cancel and revoke the certificate of

competency of the person so convicted; and such person shall not be entitled to receive another certificate of competency within three (3) months from the date of such cancellation and revocation.

For the purpose of securing an efficient enforcement of this Act, each State Mine Inspector shall make a written request upon the county board of supervisors or of commissioners in counties not under township organization, for each county in which coal is produced, for the appointment of a county mine inspector. Every State Mine Inspector shall authorize, in writing each county mine inspector within his district to assume and discharge all the powers of a State Mine Inspector in said county, with respect to compliance with the provisions of this Act. Every county mine inspector shall devote as much of his time as may be necessary to inspecting the mines in his county with a view to ascertaining whether the provisions of this Act are being complied with; and no county board shall limit the time which a county mine inspector may devote to a proper compliance with this provision, but this provision shall not be held to lessen the duty of a state mine inspector under the general mining law of the State.

If any county mine inspector shall find that any provision of this Act is being violated, it shall be his duty to file a sworn complaint before any court of competent jurisdiction, stating the facts within his knowledge in such case and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's Attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

Each county mine inspector shall report at least once a month to the State Mine Inspector for the district in which such county is located, stating the mines he has examined, the violations of this Act which he has discovered and the complaints he has filed under the provisions of this Act.

If the county mine inspector shall fail to file a complaint, as herein required, of a violation of this Act which he shall have reported to the State Mine Inspector, in all other cases of violation of this Act which shall have come to the knowledge of a State Mine Inspector in the discharge of his duties, it shall be the duty of such State Mine Inspector to file a sworn complaint before any court of competent jurisdiction, stating the facts reported to him by the county mine inspector, or coming to his knowledge in the discharge of his duties, and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

If any State Mine Inspector or any county mine inspector shall willfully fail, neglect or refuse to file a complaint as herein required, or shall willfully disregard the duties required of him by the provisions of this Act, a sworn complaint may be filed by any person having knowledge of the facts, before any court of competent jurisdiction, charging said county mine inspector or said State Mine Inspector, as the case may be, with nonfeasance in office and asking that such inspector be bound over to the next grand jury for said county, and the State's Attorney for the county in which such violation occurs shall prosecute such complaint as provided by law in other State cases.

Upon final conviction for nonfeasance in office under the provisions of this Act, of any State Mine Inspector or any county mine inspector, his certificate of qualification or of competency, as the case may be, shall be thereby invalidated and he shall become disqualified from holding such office, and such person shall not be entitled to receive another certificate of qualification or of

competency, as the case may be, within three (3) months from the date of such final conviction.

SEC. 8. Whereas, An emergency exists; therefore, this Act shall be in force and effect from and after its passage.

FIRST AMENDATORY ACT, 1911.

LAWS 1911, P. 419.

JUNE 7, 1911.

AN ACT to amend sections, 2, 4, 5, 6, and 7 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved March 8, 1910, in force March 8, 1910.

SECTION 1. Be it enacted, etc.: That sections 2, 4, 5, 6 and 7 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved March 8, 1910, in force March 8, 1910, be and the same are amended to read as follows:

SEC. 2. (a) There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe, tank or pond.

(b) Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passageways leading from the bottom of each of said shafts to such extent and in such position that with one (1) fifty foot length of hose the water may be carried into all such entries and passage ways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines such area to be designated in this Act as the fire protected area.

(c) Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

(d) There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half (1½) inch inside diameter linen hose or rubber-lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and the connections therefor on the supply pipes shall have American Standard iron pipe threads. The nozzles on such (hose) shall be not less than three-eighths (¾) nor more than five-eighths (⅝) inch in diameter.

(e) Where any part of any passageway or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less than one and one half (1½) inch pipes connected with the fire fighting water supply, and such sprinklers shall not be more than ten (10) feet apart.

(f) In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid and there shall be one such sprinkler for each eight (8) feet square of horizontal area of such cribbing or lagging.

(g) In every underground stable, located within one thousand (1,000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall be not less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic water sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire fighting water supply.

(h) All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

(i) In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall be not less than two (2) barrels full of water and two (2) metal pails with each barrel in each entry or passageway into which such stable opens and not more than fifty (50) feet from the opening of the stable.

(j) There shall also be one (1) not less than three (3) gallon chemical fire extinguishers and two (2) not less than (6) gallon handpump buckets in each stable and in each entry or passageway into which such stable opens not more than fifty (50) feet from the opening of such stable: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required. Such chemical fire extinguishers and hand-pump buckets shall be kept filled and ready for use.

(k) Provided, however, that in coal mines in which less than ten (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine, barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) hand-pump buckets of not less than six (6) gallons capacity, and said buckets shall be kept filled and ready for use.

(l) A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

(m) All mines shall have at least one, not less than (3) gallon chemical fire extinguisher, and one not less than six (6) gallon hand-pump bucket, including those hereinbefore in this Act required, for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

SEC. 4. (a) No underground stable, unless so constructed as to be fire-proof throughout, shall be nearer than six (6) yards to any regular traveling way, and every underground stable shall have at each opening a fireproof door with a door frame of concrete, stone or brick laid in mortar.

(b) Every such stable, which contains more than ten (10) stalls, shall have a cement or brick partition, with a fireproof door therein, for each ten (10) stalls or less; or, in lieu of said partition, the stable shall be lined with cement

plaster or wire lathing or other fireproof material, where inflammable material is exposed.

(c) All hay, bedding and feed underground, except that in the manger and stalls, shall be kept in a closed cement, brick, stone or metal receptacle; and not more than forty-eight (48) hours' supply of hay or bedding shall be kept underground, and not more than one week's supply of grain.

(d) All hay and bedding taken into the mine shall be baled. Hay, bedding and feed shall be taken into the mine only in a closed car or box, which shall be kept closed until the materials are removed to the receptacles provided therefor.

(e) No light with an unprotected flame shall be taken into an underground stable by any person.

SEC. 5. (a) There shall be a system of party line telephones which shall include one telephone on the surface not more than two hundred (200) feet from the tippie, and one at the bottom of the hoisting shaft, or, in slope or drift mines at the first cross entries in operation; and, in addition thereto, there shall be one telephone at each inside parting. Telephone lines shall be constructed in a workmanlike manner and shall be repaired promptly when necessary.

(b) On becoming aware of any serious danger requiring the inside employees to come out of the mine, it shall be the duty of the person having charge of the outside or inside telephone immediately to give notice of the danger to the other telephone stations; and it shall be the duty of all persons who receive information thereof to cooperate in giving notice thereof to all other persons in the mine. It shall be the special duty of all drivers, motormen and trip riders to notify all other drivers, motormen, trip riders or miners from whom they haul coal, of any danger requiring them to leave the mine.

(c) Certain employees whose regular work is in or near the fire protected areas shall have graded authority and designated duties in case of fire; and rules and instructions therefor shall be included in the regular rules of the mine, and such employees shall be instructed therein by the mine manager.

(d) There shall be a fire drill of such employees not less often than once in two weeks, and the pipes, connections and hose shall be tested at such drills.

SEC. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act: Provided, that paragraph(s) (a) and (b) shall not apply to mines where ten (10) men or less are employed.

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or drift mines, shall be of fireproof construction, except that cage guides may be wood: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof and walls of the passageways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be of fireproof construction, except that the coal rib or pillar may be used as a wall in such passageways.

(c) All underground stables and the openings therein shall be of fireproof construction.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire fighting equipment described in section 2, and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than three (3) gallon chemical fire extinguisher and one not less than six (6) gallon hand-pump bucket, for each fifty (50) employees

in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

Sec. 7. (a) Any wilful neglect, refusal or failure to obey the requirements or provisions of this Act, or wilfully giving a false danger signal or tampering with any of the appliances required by the provisions of this Act, shall be deemed a misdemeanor, punishable by a fine of not less than fifty dollars (\$50) and not to exceed two hundred dollars (\$200), or by imprisonment in the county jail for a period not exceeding three (3) months, or both, in the discretion of the court.

(b) Upon final conviction of any mine manager or any miner, under the provisions of this Act, his certificate of competency shall be thereby invalidated; and it shall be the duty of the State Mining Board in the case of a mine manager of the miners' examining board which shall have issued such certificate in the case of a miner, to cancel and revoke the certificate of competency of the person so convicted; and such person shall not be entitled to receive another certificate of competency within three (3) months from the date of such cancellation and revocation.

(c) If any State Mine Inspector, or any county mine inspector shall find that any provision of this Act is being violated, it shall be his duty to file a sworn complaint before any court of competent jurisdiction, stating the facts within his knowledge in such case and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

Each county mine inspector shall report at least once a month to the State Mine Inspector for the district in which said county (mine inspector) is working, stating the mines he has examined, the violations of this Act which he has discovered and the complaints he has filed under the provisions of this Act.

(d) If the county mine inspector shall fail to file a complaint, as herein required, of a violation of this Act which he shall have reported to the State Mine Inspector, and in all other cases of violation of this Act which shall have come to the knowledge of a State Mine Inspector in the discharge of his duties it shall be the duty of such State Mine Inspector to file a sworn complaint before any court of competent jurisdiction, stating the facts reported to him by the county mine inspector, or coming to his knowledge in the discharge of his duties, and asking that the person charged with such violation be bound over to the next grand jury for said county; and it shall be the duty of the State's attorney for the county in which such violation occurs to prosecute such complaint as provided by law in other State cases.

(e) If any State Mine Inspector or any county mine inspector shall wilfully fail, neglect or refuse to file a complaint as herein required, or shall wilfully disregard the duties required of him by the provisions of this Act, a sworn complaint may be filed by any person having knowledge of the facts, before any court of competent jurisdiction, charging said county mine inspector or said State Mine Inspector, as the case may be, with nonfeasance in office and asking that such inspector be bound over to the next grand jury for said county, and the State's attorney for the county in which such violation occurs shall prosecute such complaint as provided by law in other State cases.

Upon final conviction for nonfeasance in office under the provisions of this Act, of any State Mine Inspector or any county mine inspector, his certificate of qualification or of competency, as the case may be, shall be thereby invalidated and he shall become disqualified from holding such office, and such

person shall not be entitled to receive another certificate of qualification or of competency, as the case may be, within three (3) months from the date of such final conviction.

(SEC. 2.) SEC. 8. Whereas an emergency exists, therefore, this Act shall be in force and effect from and after its passage.

SECOND AMENDATORY ACT, 1913.

LAWS 1913, P. 484.

JUNE 26, 1913.

AN ACT to amend sections 2 and 6 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 2 and 6 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved and in force March 8, 1910, as amended by Act approved and in force June 7, 1911, be and the same are hereby amended so as to read as follows:

SEC. 2. (a) There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe, tank or pond.

(b) Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passageways leading from the bottom of each of said shafts to such extent and such position that with one (1) fifty foot length of hose the water may be carried into all such entries and passageways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines, such area to be designated in this Act as the fire protected area;

(c) Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

(d) There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half (1½) inch inside diameter linen hose or rubber-lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and connections therefor on the supply pipes shall have American standard iron pipe threads. The nozzles on such hose shall be not less than three-eighths (¾) nor more than five-eighths (⅝) inch in diameter.

(e) Where any part of any passageway or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less than one and one-half (1½) inch pipes connected with the fire

fighting water supply, and such sprinklers shall not be more than ten (10) feet apart.

(f) In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid and there shall be one such sprinkler for each eight (8) feet square or horizontal area of such cribbing or lagging.

(g) In every underground stable, located within one thousand (1,000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall not be less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire fighting water supply.

(h) All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

(i) In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall not be less than two (2) barrels full of water and two (2) metal pails with each barrel in each entry or passageway into which such stable opens and not more than fifty (50) feet from the opening of the stable.

(j) There shall also be one (1) not less than three (3) gallons chemical fire extinguishers and two (2) not less than six (6) gallon hand-pump buckets in each stable and in each entry or passageway into which such stable opens not more than fifty (50) feet from the opening of such stable: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required. Such chemical fire extinguishers and hand-pump buckets shall be kept filled and ready for use.

(k) Provided, however, that in coal mines in which less than (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine, barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) hand-pump buckets of not less than six (6) gallons capacity, and said buckets shall be kept filled and ready for use.

(l) A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

(m) All mines shall have at least one, not less than three (3) gallon chemical fire extinguisher; and one not less than six (6) gallon hand-pump bucket, including those hereinbefore in this Act required, for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and three (3) fire extinguishers of three (3) gallons each in each building located within one hundred (100) feet of any shaft, drift or slope, and such extinguishers shall be recharged once every six months and a record made of the date of recharging in the mine examiner's report book: Provided, this does not apply to buildings constructed of fire proof material. Such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

SEC. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act: "Provided, that paragraphs (a) and (b) shall not apply to mines where ten (10) men or less are employed."

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or drift mines, shall be of fireproof construction, except that cage guides may be wood. All drifts and slopes that are opened after the passage of this Act must be of fireproof construction for a distance of three hundred (300) feet from the entrance: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof and walls of the passageways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be of fireproof construction, except that the coal rib or pillar may be used as a wall in such passageways.

(c) All underground stables and the openings therein shall be of fireproof construction.

Stables in mines opened after the passage of this Act, shall not be located between the main and escapement shaft, or in direct line on the ventilating current or on passageways leading to the escapement shaft or shafts.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire fighting equipment described in section 2, and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than three (3) gallons chemical fire extinguisher and one not less than six (6) gallon hand-pump bucket, for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

THIRD AMENDATORY ACT, 1915.

LAWS 1915, P. 522.

JUNE 23, 1915.

AN ACT to amend sections 1, 2 and 6 of an Act entitled, "An Act," etc. (same as in section 1).

SEC. 1. Be it enacted, etc.: That sections 1, 2 and 6 of an Act entitled, "An Act to require fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of lives from fires in coal mines," approved and in force March 8, 1910, as amended by Act approved and in force June 7, 1911, as amended by Act approved June 26, 1913, in force July 1, 1913, be amended to read as follows:

SEC. 1. On and after July 1, 1910, except as hereinafter in section 6 of this Act is provided, the following requirements for fire fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines shall be strictly observed by all persons, firms, corporations or associations maintaining and operating a coal mine within the State of Illinois.

SEC. 2. (a) There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe, tank or pond.

(b) Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less

than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passageways leading from the bottom of each of said shafts to such extent and such position that with one (1) fifty-foot length of hose the water may be carried into all such entries and passageways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines, such area to be designated in this Act as the fire protected area;

(c) Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

(d) There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half (1½) inch inside diameter linen hose or rubber-lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and connections therefor on the supply pipes shall have American standard iron pipe threads. The nozzles on such hose shall be not less than three-eighths (¾) nor more than five-eighths (⅝) inch in diameter.

(e) Where any part of any passage or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less than one and one-half (1½) inch pipes connected with the fire fighting water supply, and such sprinklers shall not be more than ten (10) feet apart.

(f) In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid and there shall be one such sprinkler for each eight (8) feet square or horizontal area of such cribbing or lagging.

(g) In every underground stable, located within one thousand (1,000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall not be less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire fighting water supply.

(h) All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

(i) In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall not be less than two (2) barrels full of water and two (2) metal

palls with each barrel in each entry or passageway into which such stable opens and not more than fifty (50) feet from the opening of the stable.

(j) There shall also be one (1) not less than two and one-half (2½) gallons chemical fire extinguishers and two (2) not less than six (6) gallon hand-pump buckets in each stable and in each entry or passageway into which such stable opens not more than fifty (50) feet from the opening of such stable: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required. Such chemical fire extinguishers and hand-pump buckets shall be kept filled and ready for use.

(k) Provided, however, that in coal mines in which less than ten (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine, barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) hand-pump buckets of not less than six (6) gallons capacity, and said buckets shall be kept filled and ready for use.

(l) A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

(m) All mines shall have at least one, not less than two and one-half (2½) gallon chemical fire extinguisher, and one not less than six (6) gallon hand-pump bucket, including those hereinbefore in this Act required, for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and three (3) fire extinguishers of two and one-half (2½) gallons each in each building located within one hundred (100) feet of any shaft, drift or slope, and such extinguishers shall be recharged once every six months and a record made of the date of recharging in the mine examiner's report book: Provided, this does not apply to buildings constructed of fire proof material. Such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

Sec. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act: "Provided that paragraphs (a) and (b) shall not apply to mines where ten (10) men or less are employed."

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or drift mines, shall be of fire proof construction, except that cage guides may be wood. All drifts and slopes that are opened after the passage of this Act must be of fire proof construction for a distance of three hundred (300) feet from the entrance: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof and walls of the passageways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be of fire proof construction, except that the coal rib or pillar may be used as a wall in such passageways.

(c) All underground stables and the openings therein shall be of fire proof construction. Stables in mines opened after the passage of this Act shall not be located between the main and escapement shaft, or in direct line on the ventilating current or on passageways leading to the escapement shaft or shafts.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire fighting equipment described in section 2, and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than two and one-half (2½) gallons chemical fire extinguisher and one not less than six (6) gallon hand-pump bucket, for each fifty (50) employees in the mines with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

MINE INSPECTORS.

INSPECTORS TO FURNISH INFORMATION TO GEOLOGISTS.

LAWS 1891, P. 167. (FOR ANNOTATIONS SEE PAGE 245.) JUNE 18, 1891.

(Repealed by Act of June 15, 1895, Laws 1895, p. 252. See page 162.)

AN ACT to require inspectors of mines to furnish information to the State Geologist, and to provide for paying the expenses of the same.

SECTION 1. Be it enacted, etc.: That in addition to the duties now prescribed by law, it shall hereafter be the duty of the State inspectors of coal mines to procure for, and under the direction of, the State Geologist, a true record of the various strata through which coal shafts are sunk, or borings for coal, oil, gas or artesian water are made in their respective districts; also to determine the altitude of the top of said shafts or bore holes, above some specified point on the nearest railroad, or other point whose elevation may be readily ascertained; and also to determine the dip of the coal stratum in all mines which are being operated. The additional duties herein prescribed for said inspector shall be discharged at such times and in such manner as not to interfere with their primary duties as inspectors of mines, and they shall report the results of their observations, from time to time, to the State Geologist.

SEC. 2. The actual and necessary traveling expenses of said inspectors, in the discharge of their public duties, shall be allowed and paid from the same fund and in the same manner as that in which compensation for their services is now paid, and upon itemized quarterly accounts, verified by affidavit, and approved by the secretary of the Commissioners of Labor Statistics and the Governor.

DUTY AS TO WEIGHING COAL.

LAWS 1895, P. 255.

(SEE PAGE 393.)

JUNE 4, 1895.

AN ACT to make mine inspectors, inspectors of weights and measures at coal mines.

SECTION 1. Be it enacted, etc.: That mine inspectors in this State shall be ex officio inspectors of weights and measures of scales used to weigh coal in their respective districts in this State, and they are hereby empowered to, and it shall be their duty to test the scales in such district used to weigh coal mined in coal mines or sold, at least once every six months, to ascertain whether such scales correctly measure the weight of such coal, and if they find any defects or irregularities in such scales which prevent correct measurements of weights, they shall call attention of the mine owner, agent or operator to the same, and direct the same to be at once properly adjusted and corrected.

SEC. 2. If the owner, agent or operator of any coal mine shall refuse to allow such inspectors to properly test the scales used at such mines, or shall fail or refuse to put such scales into proper condition to correctly weigh coal, upon being notified so to do by the inspector of his district, such owner, agent or operator shall be guilty of a misdemeanor, and, upon conviction thereof, shall be fined not exceeding five hundred (500) dollars, or confined in the county jail not exceeding six months, or both, in the discretion of the court. And it shall be the duty of the State's Attorneys in their respective counties to prosecute any person violating the provisions of this act, the same as in other cases of misdemeanor.

REVISIONS AND AMENDMENTS.

NOTE.—For parts of section 12 of the Act of April 18, 1899; of section 5 of the Act of June 6, 1911; of section 5 of the Amendatory Act of June 27, 1913; and of section 5 of the Amendatory Act of June 28, 1915, relating to State inspectors as sealers of weights and measures, see pages 76, 83, 89, 192.

REVISION OF 1899.

LAWS 1899, P. 301.

APRIL 18, 1899.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Paragraphs (g) and (h) of sec. 12 of this Act are the same as paragraphs (j) and (k) of the Act of 1913 below.

REVISION OF 1911.

LAWS 1911, P. 388.

JUNE 6, 1911.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Paragraphs (j) and (k) of sec. 5 of this Act are the same as paragraphs (j) and (k) of the Act of 1913 below.

FIRST AMENDATORY ACT.

LAWS 1913, P. 412.

JUNE 27, 1913.

AN ACT to amend sections 1, 2, 3, 5, 6, 10, 11, 14, 16, 18, 19, 20 and 21 of an Act entitled "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911.

SECTION 1. Be it enacted, etc.:

That sections 1, 2, 3, 5, 6, 10, 11, 14, 16, 18, 19, 20, and 21 of An Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, be and the same are hereby amended so as to read as follows:

SEALER OF WEIGHTS.—(j) State inspectors are hereby made ex officio sealer of weights and measures in their respective districts, and as such are empowered to test all scales used to weigh coal at coal mines. Upon the written request of any mine owner or operator, or of ten coal miners employed at any one mine, it shall be the duty of the inspector to test any scale or scales at such mine against which complaint is directed, and if he shall find that they or any of them do not weigh correctly, he shall call the attention of the mine owner or operator to the fact, and direct that said scale or scales be at once overhauled and readjusted so as to indicate only true and exact weights, and he shall forbid the further operation of such mine until such scales are adjusted. In the event that such tests shall conflict with any test made by any county sealer of weights, or under and by virtue of any municipal ordinance or regulation, then the test by such mine inspector shall prevail.

TEST WEIGHTS.—(k) For the purpose of carrying out the provisions of this Act, each State inspector shall be furnished by the State with a complete set of standard weights suitable for testing the accuracy of tract [track] scales and of all smaller scales at mines, said test weights to be paid for on bills of particulars, certified by the Secretary of State and approved by the Governor. Such test weights shall remain in the custody of the inspector for use at any point within his district, and for any amounts expended by him for the storage, transportation or handling of the same, he shall be fully reimbursed upon making entry of the proper items in his expense voucher. (See page 386.)

SECOND AMENDATORY ACT.**LAWS 1915, P. 506.****JUNE 28, 1915.**

AN ACT to amend sections 2, 3, 5, 6, 7, 9, 10, 15, 21 and 25 of An Act entitled, "An Act," etc. (same as in section 1). (See page 238.)

SECTION 1. Be it enacted, etc.:

That sections 2, 3, 5, 6, 7, 9, 10, 15, 21, and 25 of An Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, approved June 28, 1913, in force July 1, 1913, be and the same are hereby amended so as to read as follows:

SPECIAL SURVEY.—(j) The State inspector of mines, or the State Mining Board, may order a survey to be made of the workings of any mine in addition to the regular annual survey, the results to be extended on the maps of the same and the copies thereof, whenever the safety of the workmen, unlawful injury to the surface, unlawful encroachment upon adjoining property, or the safety of an adjoining mine requires it. If the State inspector of mines or the State Mining Board shall believe any map required by this Act is materially inaccurate or imperfect, the State inspector or State Mining Board is authorized to make, or cause to be made, a correct survey and map at the expense of the operator, the cost recoverable as for debt: Provided, if such test survey shows the operator's map to be correct, the State shall be liable for the expense incurred, payable in such manner as other State accounts incurred by the State Mining Board.

PENALTIES FOR FAILURE.—(k) If an operator of any mine refuses or willfully neglects, for a period of three months, to furnish the said State inspector, the county recorder and the manager of the rescue stations the map or plan of such mine, or a copy thereof, or of the extensions thereto, as provided for in this Act, such operator shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined not less than ten dollars nor more than one hundred dollars, in the discretion of the court, and shall stand committed to the county jail until such fine is paid, and, in addition thereto, the State inspector or State Mining Board is hereby authorized to make, or cause to be made an accurate map or plan of such mine at the expense of the operator thereof; and the cost of the same may be recovered by law from the operator in the same manner as other debts by suit, in the name of the State inspector or the State Mining Board, and for his or its use, and copies of the same shall be filed by him or the board, one each with said recorder and Mine Rescue Station Commission.

APPROPRIATION.**LAWS 1893, P. 52.****JUNE 15, 1893.**

AN ACT to provide for the ordinary and contingent expenses of the State government until the expiration of the first fiscal quarter after the adjournment of the next regular session of the General Assembly.

SECTION 1. Be it enacted, etc.: That the following named sums, or so much thereof as may be necessary, respectively, for the purposes hereinafter named, be and are hereby appropriated to meet the ordinary and contingent expenses of the State government until the expiration of the first fiscal quarter after the adjournment of the next regular session of the General Assembly: * * *

Forty-first. To the State Inspectors of Coal mines, for defraying traveling expenses while in the discharge of their public duties, the sum of \$1000 per annum, or so much thereof as may be necessary, to be paid on itemized vouchers approved by the Governor.

Forty-second. To the State Board of Examiners for Mine Inspectors and Mine Managers for the per diem and expenses of the board in conducting examina-

tions as to the qualifications of those holding or desiring positions as managers of coal mines and of those desiring appointments as State inspectors of mines, the sum of \$1,500 per annum or so much thereof as may be necessary, payable upon proper vouchers approved by the Governor.

BOARD OF EXAMINERS—APPROPRIATIONS.

LAWS 1886, P. 51.

JUNE 15, 1886.

AN ACT to provide for the ordinary and contingent expenses of the State government until the expiration of the fiscal quarter after the adjournment of the next regular session of the General Assembly.

SECTION 1. Be it enacted, etc.: That the following named sums, or so much thereof as may be necessary, respectively, for the purposes hereinafter named, be and are hereby appropriated to meet the ordinary and contingent expenses of the State Government until the expiration of the first fiscal quarter after the adjournment of the General Assembly: * * *

44. The State Board of Examiners for Mine Inspectors and Mine Managers, for the per diem and expenses of the board in conducting examinations as to the qualifications of those holding or desiring positions as managers of coal mines, and of those desiring appointments as State inspectors of mines, the sum of \$1,500 per annum, or so much thereof as may be necessary, payable upon proper vouchers approved by the Governor.

* * * * *

APPROPRIATIONS.

LAWS 1897, 52, P. 61.

JUNE 5, 1897.

AN ACT to provide for the ordinary and contingent expenses, etc., (same as former act).

45. Appropriation \$3,000.

LAWS 1899, 55, P. 62.

APRIL 19, 1899.

AN ACT to provide for the ordinary and contingent expenses, etc., (same as former act).

Appropriation \$7,000.

LAWS 1901, 73, P. 85.

MAY 19, 1901.

AN ACT to provide for the ordinary and contingent expenses, etc., (same as former act).

Appropriation \$7,500, including: Salary of stenographer \$720, secretary of board \$1,500, State Mine Inspectors \$2,000.

LAWS 1903, 69, P. 76.

MAY 16, 1903.

AN ACT to provide for the ordinary and contingent expenses, etc., (same as former act).

Appropriation \$6,000, including: Stenographer \$720, State Mine Inspectors, \$2000 (expenses).

BOARD OF EXAMINERS—SALARIES.

LAWS 1905, P. 330.

MAY 16, 1905.

AN ACT to amend section 10 of an act entitled, "An act, etc. (same as in section 1). (Act approved April 18, 1899.)

SEC. 10. Members of State Mining Board \$5 per day, not more than 100 days; mining engineer \$5 per day not more than 125 days; expenses for all.

Secretary \$1,500 and expenses.

APPROPRIATIONS.**LAWS 1905, 62, P. 69.****MAY 18, 1905.**

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

* * * * *

Thirty-seventh. Commissioners of Labor Statistics, for expenses, etc., \$11,000.
 State Mining Inspectors, for expenses, \$4,500 per annum, not over \$600 to any one inspector.

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LAWS 1907-8, 17, P. 25 (ADJOURNED SESS.).**JUNE 4, 1907.**

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

* * * * *

Forty-fifth. State Mine Inspectors, \$6,000 per annum, not over \$600 to any one inspector.

* * * * *

LAWS 1909, 77, P. 35.**JUNE 16, 1909.**

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SECTION 1. Be it enacted, etc.: That the following named sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State government, etc.: * * *

Forty-fifth. To the State Mine Inspectors, for actual expenses incurred in the discharge of duties, \$6,000 per annum, not to exceed \$600 to any one inspector.

* * * * *

LAWS 1911, P. 69.**MAY 10, 1911.**

AN ACT to provide for a deficiency in the traveling and other expenses of the State inspectors of coal mines for the fiscal year ending June 30, 1911.

SECTION 1. Be it enacted, etc.: That the sum of \$6,000 or as much thereof as may be necessary, be, and is hereby appropriated for the purpose of meeting the traveling and other necessary expenses of the State inspectors of coal mines incurred in the discharge of their official duties, for the fiscal year ending June 30, A. D. 1911.

SEC. 2. Whereas, Said sum of money is immediately required, therefore, an emergency exists and this Act shall take effect from and after its passage.

LAWS 1911, 90, P. 101.**JUNE 10, 1911.**

AN ACT to provide for the ordinary and contingent expenses of the State government until the expiration of the first fiscal quarter after the adjournment of the next regular session of the General Assembly.

SEC. 1. Be it enacted by the People, etc. * * *

Forty-fifth. To the State Mine Inspectors for actual expenses incurred in the discharge of their duties as provided by law, the sum of \$12,000 per annum, of which sum not to exceed \$1,000 per annum shall be paid to any one inspector.

INSTRUMENTS USED IN MINES—APPROPRIATION.**LAWS 1911-12, 20, P. 23.****JUNE 6, 1912.**

AN ACT to amend section one (1) of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section one (1) of an Act entitled, "An Act to provide for the ordinary and contingent expenses of the State Govern-

ment, etc." approved June 10, 1911, in force July 1, 1911, be and the same is hereby amended to read as follows:

SEC. 1. That the following named sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc. * * *

Thirteen. To the Secretary of State, for the purchase of safety lamps, hydrometers, barometers, anemometers, and such other instruments as the needs of the service of the State Mine Inspectors requires (require) as provided by law, the sum of \$1,000 or so much thereof as may be necessary.

APPROPRIATIONS.

LAWS 1913, 95, P. 107.

JUNE 30, 1913.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SEC. 1. Be it enacted, etc.: That the following sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc. * * *

Forty-fifth. To the State Mine Inspectors, \$12,000 per annum, of which sum not to exceed \$1,000 per annum shall be paid to any one inspector.

* * * * *

LAWS 1915, 208, P. 215.

JUNE 29, 1915.

AN ACT to provide for the ordinary and contingent expenses of the State Government.

SECTION 1. Be it enacted, etc.: That the following named sums be, and are hereby appropriated to meet the ordinary and contingent expenses of the State Government, etc.: * * *

Fortieth. To the State Mine Inspectors, for actual expenses incurred in the discharge of their duties, as provided by law, the sum of \$12,000 per annum, etc., of which sum not to exceed \$1,200 per annum shall be paid to any one inspector.

* * * * *

MINE MANAGERS.

FOREMAN, PIT BOSS, FIRE BOSS, HOISTING ENGINEER.

EXAMINATION AND EMPLOYMENT.

LAWS 1891, P. 168. (FOR ANNOTATIONS, SEE PAGE 245.) JUNE 18, 1891.

AN ACT to provide for the examination of mine managers, and to regulate their employment.

SECTION 1. Be it enacted, etc.: That in order to secure greater efficiency in the management of coal mines, and a higher standard of qualifications in those who have immediate responsibility for the health and safety of persons employed in coal mines, it shall be unlawful, except as hereinafter provided, after the first day of January, 1892, for any person to assume or attempt to discharge the duties of mine manager, at any coal mine equipped for shipping coal by rail or water, or any mine whose output may be twenty-five or more tons per day, unless he shall hold such a certificate as to his qualifications for that position as may be required by this act from the State board of mine examiners: Provided, that the term mine manager is here intended to mean any person who is charged with the general direction of the underground work, or of both the underground and top work, of any coal mine, and who is commonly known and designated as mine boss or foreman or pit boss.

SEC. 2. The certificates provided for in the first section of this act may be either certificates of competency or certificates of service, and any person may acquire such certificate by appearing before the State board of examiners, appointed by the commissioners of labor for the examination and inspection of mines, and submitting to such an examination as to his competency or length of service as may be prescribed by this act and the said examiners.

SEC. 3. Meetings of said boards shall be held at such times and places, and shall be conducted under such rules, conditions and regulations as the members of said boards may deem most efficient for carrying into effect the spirit and intent of this act. Said board shall, after each of its several meetings, make report of its action and of its term of service to the State commissioners of labor, and the sum of three dollars a day and traveling expenses for each day devoted to the service required by this act, which shall not exceed eighty days in all during any one year, shall be paid to each of the members of said Board upon vouchers sworn to by them and approved by the Governor and the Auditor of Public Accounts is hereby authorized to draw his warrant on the Treasurer, payable out of any money in the treasury not otherwise appropriated, in favor of the said members of the board of examiners for the amounts thus shown to be due them.

SEC. 4. Certificates of qualification or competency shall be conferred upon any citizen of the United States who shall submit to and satisfactorily pass such an examination as to his fitness for the duties and responsibilities of mine manager as said examiners shall provide; and certificates of service shall be conferred upon any citizen of the United States who shall present satisfactory evidence of having had at least four years' practical experience in coal mines, and of having served as mine manager continuously and satisfactorily and for the same person or firm for one year next preceding the passage of this act,

but the holder of such certificate shall not be eligible to employment by any other person or firm until he shall also have obtained a certificate of competency upon examination. The certificates herein provided for shall be issued by the State board of examiners and be registered in the office of the commissioners of labor at the capitol, where a record of all certificates issued shall be kept. Such certificates shall contain the full name, age and place of birth of the recipient, and also the length and nature of his previous service in and about coal mines. All applicants for the certificates herein provided for shall, before being examined, pay to the board the sum of one dollar each, and those who receive certificates shall pay an additional sum of two dollars each, all of which fees shall be accounted for and covered into the State treasury.

Sec. 5. After January 1, 1892, no owner, operator, or agent of any mine to which this act applies shall employ any mine manager who does not hold either the certificate of competency or service herein provided for, and if any accident shall occur in any mine in which a mine manager shall be employed who has no certificate of competency or service as required by this act, by which any miner shall be killed or injured, he or his heirs shall have right of action against such operator, owner or agent, and shall recover the full value of the damages sustained: Provided, that in case no suitable or satisfactory certified mine manager can be obtained by any operator at the date herein specified, such operator may place any competent man in temporary charge of his mine to act as mine manager until such time as a suitable certified manager may be found: Provided, that the time be not more than three months from the date aforesaid. The said board of examiners shall be furnished by the Secretary of State with the necessary blanks, blank books and stationery. Any violation of the provisions of this act shall be deemed a misdemeanor and be punished accordingly.

AMENDATORY ACT, 1895.

LAWS 1895, P. 265.

JUNE 21, 1895.

AN ACT to amend paragraph "A" of section 4 of an act entitled "An act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That paragraph "A" of section 4 of 'An act to provide for the examination of mine managers, and to regulate their employment,' approved June 18, 1891, in force July 1, 1891, be and the same is hereby amended to read as follows:

Certificates of qualification or competency shall be conferred upon any citizen of the United States who shall submit to and satisfactorily pass an examination as to his fitness for the duties and responsibilities of the position of mine manager as said examiners shall provide: Provided, said person applying to be qualified as mine manager shall have actually served and worked for at least four years as a practical coal miner, and said certificates of qualification or competency shall be conferred upon any citizen of the United States who shall present satisfactory evidence of having had at least four years of practical experience as a coal miner, and, of having served as mine manager continuously and satisfactorily for the same person, firm or corporation for one year, and all persons in this State, holding certificates of service, as provided in the act relating to examination of mine managers before this amendment, shall be entitled to have said certificates of qualification or competency conferred upon them, and it shall be the duty of the State Board of Examiners to so confer said certificate, which shall entitle and empower the holder thereof to act in the capacity of mine manager of any mine and for any person, firm or corporation in the State of Illinois.

All acts or parts of acts in conflict with this act are hereby repealed.

CERTIFICATES TO FIRE BOSSES AND HOISTING ENGINEERS.

LAWS 1895, P. 250.

JUNE 21, 1895.

AN ACT to provide for the examinations of fire bosses and hoisting engineers at all coal mines in this State, where such services are necessary, and to regulate their employment.

SECTION 1. Be it enacted, etc.: That in order to secure the health and safety of persons employed in coal mines, that it shall be unlawful, after one year from date of this act going into effect, for any one to assume or attempt to discharge the duties of hoisting engineer or fire boss at any coal mine in this State, where the service of hoisting engineer or fire boss is necessary, unless he shall hold such a certificate as to his qualification for that position as may be required by this act, from the State Board of Mine Examiners.

SEC. 2. The certificates, provided for in the first section of this act, may be either certificates of competency or certificates of service, and any person may acquire such certificate by appearing before the State Board of Examiners, appointed by the commissioners of labor for the examination and inspection of mines, and submitting to such an examination as to his competency or length of service as may be prescribed by this act and the said examiners.

a. Certificates of qualification or competency shall be conferred on any citizen of the United States who shall submit to and satisfactorily pass such an examination as to his fitness for the duties and responsibilities of hoisting engineers and fire bosses as the Board of Mine Examiners shall provide, and certificates of service shall be conferred on any citizen of the United States who shall present satisfactory evidence of having had at least 4 years' practical experience as such fire boss or hoisting engineer, and of having served as such fire boss or hoisting engineer continuously and satisfactorily for the same person or firm for one (1) year next preceding the passage of this act, but the holder of such certificate shall not be eligible to employment by any other person or firm until he shall also have obtained a certificate of competency upon examination. Before certificates are issued to any one under this act, it will be necessary for the applicants for such certificates to file with the Board of Examiners certificates of good moral character, signed by at least ten (10) reputable citizens in the community where the applicant resides.

b. The certificates herein provided for shall be issued by the State Board of Examiners and be registered in the office of the commissioners, of labor, at the capitol, where a record of all certificates issued shall be kept. Such certificates shall contain the full name, age and place of birth of the recipient, and also the length of his previous service as such fire boss or hoisting engineer.

c. All applicants for the certificates herein provided for shall, before being examined, pay to the Board of Examiners the sum of one dollar each, and those who receive certificates shall pay an additional sum of two dollars each, all of which fees shall be accounted for and covered into the State treasury.

SEC. (3) 4. After July 1, 1896, no owner, operator or agent of any coal mine in this State where hoisting engineers are required to hoist coal or men out of the mine, or where fire or explosive gas generates, where the employment of a fire boss is necessary to examine the mine as to whether or not it is safe for men to enter and pursue their calling without danger from explosive gas, shall not employ any person whatever as hoisting engineer or fire boss unless they have a certificate of competency or service herein provided for. And if any accident shall occur at or in any mine where a hoisting engineer or fire boss is employed who has no certificate of competency or service as required by this act, by which any person shall be killed or injured, he, or his heirs, shall have a right of action against such operator, owner or agent, and shall recover the full value or damages sustained.

MINERALS.

LEAD—SALES REGULATED.

LAWS 1861, P. 140.

FEBRUARY 22, 1861.

AN ACT to regulate the purchase and sale of Lead Mineral.

SECTION 1. Be it enacted, etc.: That from and after the passage of this act all persons purchasing lead mineral, in this State, shall keep a book or books, to be open, at all reasonable times, to the inspection of miners, owners of mineral lands, and smelters of lead ore, in which book shall be kept an account of all lead mineral purchased by the person or persons keeping such book, stating clearly the amount, from whom, the time when purchased, and the place where it was dug. Said books to be kept at the usual place of business of the purchasers.

SEC. 2. That all persons buying or bartering for lead mineral and having no place of business at which to keep a book or books, as provided in section one of this act, shall make return thereof to the nearest smelter of lead ore to the land or place of procuring the mineral, stating to said smelter the amount, from whom and where obtained, when purchased and from what diggings the same was taken. And the smelter to whom such return is made, shall minute it upon his book kept under the provisions of this act.

SEC. 3. That no person shall be allowed to purchase lead mineral from any child under twelve years of age. And the picking and carrying away lead mineral from the land or diggings of another, without his or her consent, shall be deemed larceny, and punished accordingly.

SEC. 4. Any person to whom lead mineral shall be offered for sale shall inquire from whom and from what ground the same was procured; and if the person offering it for sale refuse to answer such inquiries satisfactorily then the person to whom it is offered shall not be allowed to buy it.

SEC. 5. Any person refusing to show the books of account, hereinbefore provided to be kept, when requested by any person authorized to see the same, shall forfeit and pay, for each offense, the sum of twenty-five dollars. And any persons violating any of the other provisions of this act shall forfeit and pay, for the first offense, the sum of five dollars and costs; and for the second and every subsequent offense, the sum of ten dollars and costs, one-half to the informer and the other half to the school fund of the school district where the suit is prosecuted—the informant, in all cases, to be a competent witness; and the penalties to be recoverable by action of debt, before any justice of the peace of the county where the offense is committed.

SEC. 6. This act to take effect and be in force from and after its passage.

CODIFIED IN REVISED STATUTES, 1874.

REVISED STATUTES 1874, P. 709.

MARCH 24, 1874.

AN ACT to revise the law in relation to mines.

* * * * *

SEC. 8. RECORD OF PURCHASES OF LEAD MINERAL TO BE KEPT.—Every person purchasing lead mineral shall keep a book, in which he shall keep an account of all lead mineral purchased by him, stating clearly the amount, from whom and time when purchased, and the place where it was dug; and for the purpose of ascertaining such facts, he shall make diligent inquiry of the person offering

such mineral for sale, and if satisfactory answers are not given it shall not be lawful for him to buy the same.

SEC. 9. BOOK OPEN FOR INSPECTION.—Such purchaser shall keep such book at his usual place of business, open at all reasonable times for the inspection of miners, owners of mineral lands, and smelters of lead ore.

SEC. 10. WHEN PURCHASER NO PLACE OF BUSINESS.—When any such purchaser has not a usual place of business, he shall, within twenty-four hours from the time of making any such purchase, make return to the nearest smelter of lead ore to the place of procuring the same, stating the amount thereof, when, of whom and where purchased, and from what place the same was dug or taken; and such smelter shall minute the same in his book, to be kept pursuant to this act.

SEC. 11. PURCHASE FROM CHILD UNDER 12 FORBIDDEN.—No person shall be allowed to purchase lead mineral from any child under twelve years of age.

SEC. 12. PENALTIES.—Any person who shall purchase lead mineral without keeping the book or making the entries or returns as herein provided, or shall refuse to allow their inspection as herein provided, shall forfeit for each offense the sum of \$25; and whoever violates any of the other provisions of the four preceding sections, shall forfeit for the first offense the sum of \$5 and costs, and for every subsequent offense \$10 and costs—one half to the informer, and the other half to the school fund of the school district where the suit is brought. Said penalties shall be recoverable by action of debt before any justice of the peace of the county where the offense is committed.

TRESPASS ON COAL BANKS.

LAWS 1863, P. 70.

FEBRUARY 13, 1863.

AN ACT to amend Chapter XXX of the Revised Statutes, entitled "Criminal Jurisprudence."

SECTION 1. Be it enacted, etc.: * * *

SEC. 3. If any person shall enter the coal banks of another, without the expressed or implied consent of the owner or manager thereof, after notice that such entry is prohibited, such person shall, on conviction thereof, be fined, in the discretion of the court, in any sum not exceeding five hundred dollars, or imprisoned in the county jail not more than six months.

SEC. 4. If any person shall enter the coal banks of another, with intent to commit any injury thereto, or by means of threats, intimidations, or other riotous or unlawful proceedings, to cause or induce any person employed therein to leave his employment, such person shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be subject to a fine not exceeding five hundred dollars, or be imprisoned in the county jail not exceeding six months, or both.

* * * * *

AMENDATORY ACT, 1873.

LAWS 1873, P. 76.

LAWS 1873-74, P. 93.

MARCH 19, 1873.

MARCH 19, 1873.

AN ACT to amend an act entitled "An Act to amend chapter 30 of the Revised Statutes, entitled 'Criminal Jurisprudence.'"

SECTION 1. Be it enacted, etc.: That an act entitled "An act to amend chapter 30 of the Revised Statutes, entitled 'Criminal Jurisprudence,'" approved February 13, 1863, be and the same is hereby amended, so as to read as follows:

* * * * *

SECTION 3. If any person shall enter the coal-banks of another without the expressed or implied consent of the owner or manager thereof, after notice

that such entry is prohibited, such person shall, on conviction thereof, be fined in any sum no exceeding five hundred dollars, or imprisonment in the county jail not more than six months.

SEC. 4. If any person shall enter the coal-banks of another with intent to commit injury thereto, or by threats, intimidations, or other unlawful proceedings to cause any person employed therein to leave his employment, such person shall be deemed guilty of a misdemeanor, and on conviction thereof be fined in any sum not exceeding five hundred dollars, or imprisoned in the county jail not exceeding six months, or both. (Repealed.)

MINERAL LANDS.

MINING OVER LINE—EXAMINATION OF MINE—SURVEY.

LAWS 1859, P. 126.

FEBRUARY 18, 1859.

AN ACT to regulate mining.

SECTION 1. Be it enacted, etc.: That upon complaint being made, on oath, before any circuit judge, or, in the absence of a circuit judge, before any judge of the county court of any of the counties of this state, by any person, the owner of any land or town lot adjacent to any lands, lots or grounds worked as lead, coal or iron mines, that the said person or persons, so making complaint, have reasonable grounds to suspect and do suspect that such miner or miners is trespassing upon the lands or lots of such person, so making complaint, it shall be the duty of said judge to appoint some competent and suitable person to descend into said mines and make such examinations and surveys therein as may be necessary to ascertain whether such mines are worked upon the lands or lots of such person or persons making said complaint.

SEC. 2. It shall be the duty of such miner or miners to allow such person, so appointed, at all reasonable times, to descend into said mines and make such survey or examination as may be necessary to determine whether such mines are worked upon the property of the said person making such complaint or not; and any obstruction, knowingly and willfully placed in the way of such person, so appointed by the judge, with the intent to prevent his entry into any mines, rooms or galleries therein, and his examination of said mines, by any person or persons, their workmen, agents or servants, shall be punished to the same extent and in the same manner as is now provided by law for resisting a sheriff in serving legal process.

SEC. 3. All costs and expenses attending said survey and examination of said mines, under this act, shall be advanced and paid by the person making said complaint, who shall have the right to recover the same and have them taxed as costs in any action for the recovery of damages against such miner or miners, in which he may receive damages for trespass in the working of such mines, and it shall be the duty of the court to tax such expenses in the bill of costs in any action where such damages may be recovered.

NOTE.—The substance of this act was incorporated as sections 2, 3 and 4, Revised Statutes 1874, p. 709.

MINING OVER LINE—TRESPASS.

REVISED STATUTES 1874, P. 709.

MARCH 24, 1874.

AN ACT to revise the laws in relation to mines.

* * * * *

SEC. 2. TRESPASS—SURVEYOR APPOINTED.—If the owner of and land adjacent to any lands worked as lead, coal, iron or other mine, shall make complaint, in writing, verified by affidavit, to the judge of any court of record in the county where the land is situated, that he has reasonable grounds to believe, and does believe, that the owner or operator of such mine is trespassing upon

his lands by mining thereon, it shall be the duty of the judge to appoint some county surveyor or other competent and suitable person to descend into such mine, and make such examinations and surveys as may be necessary to ascertain whether the same is being worked upon the land of the person making the complaint.

SEC. 3. POWERS OF SURVEYOR—PENALTIES.—The person so appointed shall have the right at all reasonable times, to descend into such mine and make such examinations and surveys; and whoever shall willfully obstruct or hinder such person from entering into any such mine, or any gallery or place therein, or from making any such examination or survey, shall, for each offense, be fined not exceeding \$200, to be recovered before any justice of the peace of the county. Any person accepting any such appointment, and failing or refusing to make such survey upon the request of the petitioner, may be proceeded against as for a contempt of court, or he may be fined not exceeding \$500.

SEC. 4. EXPENSES.—The expense of such examination and survey shall be paid by the person making the complaint, but if such person shall recover damages against the owner or operator of such mine for working the same upon his land, he shall have the right to have such expenses added to the damages.

SEC. 5. PENALTY FOR TRESPASS.—Whoever shall willfully trespass upon the land of another by mining thereon, shall, in addition to the damages now authorized by law, be liable to a penalty not to exceed \$500, which may be recovered in an action of debt by the owner thereof, in any court of competent jurisdiction.

MINERS' EXAMINING BOARD—STATE MINING BOARD.

EXAMINATION OF INSPECTORS—APPOINTMENT.

LAWS 1899, P. 301. (FOR ANNOTATIONS, SEE PAGE 245.) APRIL 12, 1899.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Sections 6, 7, 8, 9, and 10 of the act of April 12, 1899 (Laws 1899, p. 301), are inserted under this subject. For original act see page 187.

SEC. 6. (a) For the purpose of securing efficiency in the mine inspection service, and a high standard of qualification in those who have the management and operation of coal mines, the State Commissioners of Labor shall appoint a board of examiners, to be known as the State Mining Board, whose duty it shall be to make formal inquiry into and pass upon the practical and technical qualifications and personal fitness of men seeking appointments as State Inspectors of Mines, and of those seeking certificates of competency as mine managers, as hoisting engineers and as mine examiners. This board shall be composed of five members, two of whom shall be practical coal miners; one an expert mining engineer, and who shall, when practicable, be also a hoisting engineer, and two shall be coal operators.

DATE AND TERM OF APPOINTMENT.—(b) Their appointment shall date from July 1, 1899, and they shall serve for a term of two years, or until their successors are appointed and qualified; they shall organize by the election of one of their number as president, and some suitable person, not a member, as secretary, after which they shall all be sworn to a faithful performance of their duties.

SUPPLIES FURNISHED BY SECRETARY OF STATE.—(c) The Secretary of State shall assign to the use of the board, suitably furnished rooms in the State House for such meetings as are held at the Capitol, and shall also furnish whatever blanks, blank books, printing and stationery, the board may require in the discharge of its duties.

FREQUENCY OF MEETINGS.—(d) The board shall meet at the Capitol in regular session on the second Tuesday in September of the year 1899, and biennially thereafter, for the examination of candidates for appointment as State Inspectors of Mines. For the examination of persons seeking certificates of competency as mine managers, hoisting engineers and mine examiners, the board shall hold meetings at such times and places within the State as shall, in the judgment of the members, afford the best facilities to the greatest number of probable candidates. Special meetings may also be called, whenever, for any reason, it may become necessary to appoint one or more inspectors. Public notice shall be given through the press or otherwise, announcing the time and place at which examinations are to be held.

RULES OF PROCEDURE.—(e) The examinations herein provided for shall be conducted under such rules, conditions and regulations as the members of the board shall deem most efficient for carrying into effect the spirit and intent of this Act. Such rules, when formulated, shall be made a part of the permanent record of the board, and such of them as relate to candidates shall be published for their information and governance prior to each examination; they shall

also be of uniform application to all candidates. (Amended May 14, 1903, and May 27, 1907. Page 65.)

EXAMINATIONS.

SEC. 7. FOR INSPECTORS.—(a) Persons coming before the State Mining Board as candidates for appointment as State Inspectors of mines must produce evidence satisfactory to the board that they are citizens of this State, at least thirty years of age, that they have had a practical mining experience of ten years, and that they are men of good repute and temperate habits; they must also submit to and satisfactorily pass an examination as to their practical and technical knowledge of mining engineering and mining machinery and appliances, of the proper development and operation of coal mines, of ventilation in mines, of the nature and properties of mine gases, of the geology of the coal measures in this State, and of the laws of this State relating to coal mines.

NAMES CERTIFIED TO THE GOVERNOR.—(b) At the close of each examination for inspectors the board shall certify to the Governor the names of all candidates who have received a rating above the minimum fixed by the rules of the board as properly qualified for the duties of inspectors.

INSPECTORS APPOINTED.—(c) From those so named, the Governor shall select and appoint ten State inspectors of mines; that is to say, one inspector for each of the ten inspection districts provided for in this Act; or more, if, in the future, additional inspection districts shall be created, and their commissions shall be for a term of two years from October first: Provided, That any one who has satisfactorily passed two of the State examinations for inspectors, and who has served acceptably as State inspector for two full terms, upon making written application to the board setting forth the facts, shall also be certified to the Governor as a person properly qualified for appointment; but no man shall be eligible for appointment as a State inspector of mines who has any pecuniary interest in any coal mine, either as owner or employé.

FOR MINE MANAGERS.—(d) Persons coming before the board for certificates of competency as mine managers must produce evidence satisfactory to the board that they are citizens of this State, at least twenty-four years of age, that they have had at least four years' practical mining experience, and that they are men of good repute and temperate habits; they must also submit to and satisfactorily pass such an examination as to their experience in mines and in the management of men, their knowledge of mine machinery and appliances, the use of surveying and other instruments, the properties of mine gases, the principles of ventilation and the specific duties and responsibilities of mine managers, as the board shall see fit to impose.

FOR HOISTING ENGINEERS.—(e) Persons seeking certificates of competency as hoisting engineers must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-one years of age, that they have had at least two years' experience as fireman or engineer of a hoisting plant, and are of good repute and temperate habits. They must be prepared to submit to and satisfactorily pass an examination as to their experience in handling hoisting machinery, and as to their practical and technical knowledge of the construction, cleaning and care of steam boilers, the care and adjustment of hoisting engines, the management and efficiency of pumps, ropes and winding apparatus, and their knowledge of the laws of this State in relation to signals and the hoisting and lowering of men at mines.

FOR MINE EXAMINERS.—(f) Persons seeking certificates of competency as mine examiners must produce evidence satisfactory to the board that they are citizens of this State, at least 21 years of age, and of good repute and temperate habits,

They must be prepared to submit to and satisfactorily pass an examination as to their experience in mines generating dangerous gases, their practical and technical knowledge of the nature and properties of fire-damp, the laws of ventilation, the structure and uses of the safety lamps, and the laws of this State relating to safeguards against fires from any sources in mines. (Amended.)

CERTIFICATES.

SEC. 8. ISSUED BY THE BOARD.—(a) The certificates provided for in this Act shall be issued under the signature and seal of the State Mining Board, to all those who receive a rating above the minimum fixed by the rules of the board; such certificates shall contain the full name, age and place of birth of the recipient and the length and nature of his previous service in or about coal mines.

REGISTER TO BE PRESERVED.—(b) The board shall make and preserve a record of the names and addresses of all persons to whom certificates are issued, and at the close of each examination shall make report of the same to the commissioners of labor, who shall cause a permanent register of all certificated persons to be made and kept for public inspection in the office of the State Bureau of Labor Statistics in the State Capitol.

EFFECT OF CERTIFICATES.—(c) The certificates provided for in this Act shall entitle the holders thereof to accept and discharge the duties for which they are hereby declared qualified, at any mine in this State, where their services may be desired.

FOREIGN CERTIFICATES.—(d) The board may exercise its discretion in issuing certificates of any class, but not without examination, to persons presenting, with proper credentials, certificates, issued by competent authority in other states.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE MANAGERS.—(e) It shall be unlawful for the operator of any coal mine to employ, or suffer to serve, as mine manager at his mine, any person who does not hold a certificate of competency issued by a duly authorized board of examiners of this State: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certificated mine manager, he may place any trustworthy and experienced man, subject to the approval of the State inspector of the district, in charge of his mine, to act as temporary mine manager for a period of not exceeding thirty days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED HOISTING ENGINEER.—(f) It shall be unlawful for the operator of any mine to employ, or suffer to serve, as hoisting engineer for said mine, any person who does not hold a certificate of competency issued by a duly authorized board of examiners of this State, or to permit any other to operate his hoisting engine except for the purpose of learning to operate it, and then only in the presence of the certificated engineer in charge, and when men are not being hoisted or lowered: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certificated hoisting engineer, he may place any trustworthy and experienced man, subject to the approval of the State inspector of the district, in charge of his engines, to act as temporary engineer, for a period not to exceed thirty days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE EXAMINERS.—(g) It shall be unlawful for the operator of any mine to employ or suffer to serve, as mine examiner, any person who does not hold a certificate of competency issued by the State Mining Board: Provided, that any one holding a mine manager's certificate may serve as mine examiner. Anyone holding a certificate as fire

boss, on presentation of the same to the State Mining Board, may have it exchanged for a mine examiner's certificate.

CANCELLATION OF CERTIFICATES.—(h) The certificates of any mine manager, hoisting engineer or mine examiner, may be cancelled and revoked by the State Mining Board whenever it shall be established to the satisfaction of said board that the holder thereof has become unworthy of official endorsement, by reason of violations of the law, intemperate habits, manifest incapacity, abuse of authority, or for other causes satisfactory to said board: Provided, that any person against whom charges or complaints are made shall have an opportunity to be heard in his own behalf. And he shall have thirty days' notice in writing of such charges.

SEC. 9. CREDENTIALS.—An applicant for any certificate herein provided for, before being examined, shall register his name with the secretary of the board, and file with him the credentials required by this Act, to-wit: An affidavit as to all matters of fact establishing his right to receive the examination, and a certificate of good character and temperate habits, signed by at least ten of the citizens who know him best in the place in which he lives.

Each candidate, before receiving the examination, shall pay to the secretary of the board the sum of one dollars as an examination fee, and those who pass the examination for which they are entered, before receiving their certificates, shall also pay to the secretary the further sum of two dollars each as a certificate fee. All such fees shall be duly accounted for by the board, and covered into the State treasury at the close of each fiscal year.

SEC. 10. COMPENSATION OF MEMBERS—SALARY OF SECRETARY.—The members of the State Mining Board, except the mining engineer, shall receive as compensation for their services the sum of \$5.00 each per day, for a term not exceeding 100 days in any one year, and whatever sums are necessary to reimburse them for such traveling expenses as may be incurred in the discharge of their duties.

The salary of the secretary shall be determined by the board, but shall in no case exceed the sum of one thousand dollars per annum, and he shall be reimbursed for any amounts expended for actual and necessary traveling expenses in the discharge of his duties. All such salaries and expenses of the board and of its secretary shall be paid upon vouchers duly sworn to by each and approved by the president of the board and by the Governor, and the Auditor of Public Accounts is hereby authorized to draw his warrants on the State Treasurer for the amounts thus shown to be due, payable out of any money in the treasury not otherwise appropriated.

AMENDATORY ACT.

LAWS 1903, P. 250.

MAY 14, 1903.

AN ACT to amend section 6 of an act entitled, "An act, etc., (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 6 of an act entitled, "An act to revise the law in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be, and the same is hereby amended to read as follows:

SEC. 6. For the purpose of securing efficiency in mine inspection service, and a high standard of qualifications in those who have the management and operation of coal mines, the State Commissioners of Labor shall appoint a board of examiners, to be known as the State Mining Board, whose duty it shall be to make formal inquiry into and pass upon the practical and technical qualifica-

tions and personal fitness of men seeking appointments as State inspectors of mines, and of those seeking certificates of competency as mine managers, hoisting engineers and as mine examiners.

(a) This board shall be composed of five members, two of whom shall be practical coal miners, one a practicing hoisting engineer, and two coal operators, one of whom shall be an expert mining engineer.

(b) Their appointment shall date from July 1, 1899, and they shall serve for a term of two years, or until their successors are appointed and qualified; they shall organize by the election of one of their number as president, and some suitable person, not a member as secretary, after which they shall all be sworn to a faithful performance of their duties.

(c) The Secretary of State shall assign to the use of the board, suitably furnished rooms in the State House for such meetings as are held at the Capitol, and shall also furnish whatever blanks, blank books, printing and stationery, the board may require in the discharge of its duties.

(d) The board shall meet at the Capitol in regular session on the second Tuesday in September of the year 1899, and biennially thereafter, for the examination of candidates for appointment as State inspectors of mines; for the examination of persons seeking certificates of competency as mine managers, hoisting engineers and mine examiners. The board shall hold meetings at such times and places within the state as shall, in the judgment of the members, afford the best facilities to the greatest number of probable candidates. Special meetings may also be called by the Commissioners of Labor whenever, for any reason, it may become necessary to appoint one or more inspectors. Public notice shall be given through the press or otherwise, announcing the time and place at which examinations are to be held.

(e) The examinations herein provided for shall be conducted under such rules, conditions and regulations as the members of the board shall deem most efficient for carrying into effect the spirit and intent of this act. Such rules, when formulated, shall be made a part of the permanent record of the board, and such of them as relate to candidates shall be published for their information and governance prior to each examination; they shall also be of uniform application to all candidates.

INSPECTORS—AMENDATORY ACT.

LAW 1905, P. 225.

MAY 12, 1905.

AN ACT to amend section 7 of an act entitled, "An act to revise the laws in relation to coal mines, and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899.

SECTION 1. Be it enacted, etc.: That section 7 of an act entitled, "An act to revise the laws in relation to coal mines and subjects relating thereto and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be amended to read as follows:

SEC. 7. INSPECTORS APPOINTED.—From those so named, the Governor shall select and appoint ten State inspectors of mines; that is to say, one inspector for each of the ten inspection districts provided for in this act; or more, if, in the future, additional inspection districts shall be created, and their commissions shall be for a term of two years from October first: Provided, that any one who has satisfactorily passed two of the State examinations for inspectors, and who has served acceptably as State inspector for two full terms, upon making written application to the board setting forth the facts, shall also be certified to the Governor as a person properly qualified for appointment; but no

man shall be eligible for appointment as a State inspector of mines who has any pecuniary interest in any coal mine, either as owner or employe.

NORM.—The validity of this amendatory act is doubted for the reason that the amendatory section sets out but one paragraph of the original section. The constitution, section 18, article 4, requires that when a section of a previous law is amended, the section "shall be inserted at length in the new act."

ANNOTATIONS.

MINER—CERTIFICATE OF COMPETENCY.

A person receiving a certificate of competency from the mine examining board under this act has the right to seek employment as a "coal miner" merely and not as a "shot-firer."

Kulvie v. Bunsen Coal Co., 161 Ill. App. 617 p. 620.

AMENDATORY ACT.

LAWS 1907, P. 387.

MAY 27, 1907.

AN ACT to amend sections 6, 7, 8, 9, 18, and 19 of an Act entitled, "An Act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections six (6), seven (7), eight (8), nine (9), eighteen (18), nineteen (19), of an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, as amended by Acts approved May 13, 14, 1903, in force July 1, 1903, and as amended by Acts approved May 12, 13, 16, 1905, in force July 1, 1905, be and the same is hereby amended so as to read as follows, respectively:

THE STATE MINING BOARD.

SEC. 6. MANNER AND PURPOSE OF APPOINTMENT.—For the purpose of securing efficiency in the mine inspection service, and a high standard of qualification in those who have the management and operation of coal mines, the Governor, with the advice and consent of the Senate, shall appoint a board of examiners, to be known as the State Mining Board, whose duty it shall be to make formal inquiry into and pass upon the practical and technical qualifications and personal fitness of men seeking appointments as State Inspectors of Mines, and of those seeking certificates of competency as mine managers, as hoisting engineers and as mine examiners.

COMPOSITION OF BOARD.—(a) This Board shall be composed of five members, two of whom shall be practical coal miners, one a practicing hoisting engineer, and two coal operators, one of whom shall be an expert mining engineer.

DATE AND TERM OF APPOINTMENT.—(b) Their appointment shall date from July 1, 1899, and they shall serve for a term of two years, or until their successors are appointed and qualified; they shall organize by the election of one of their number as president, and some suitable person, not a member, as secretary, after which they shall all be sworn to a faithful performance of their duties.

SUPPLIES FURNISHED BY SECRETARY OF STATE.—(c) The Secretary of State shall assign to the use of the board, suitably furnished rooms in the State House for such meetings as are held at the capitol, and shall also furnish whatever blanks, blank books, printing and stationery, the board may require in the discharge of its duties.

FREQUENCY OF MEETINGS.—(d) The board shall meet at the capitol in regular session on the second Tuesday in September of the year 1899, and biennially thereafter, for the examination of candidates for appointment as State inspectors of mines. For the examination of persons seeking certificates of competency as mine managers, hoisting engineers and mine examiners, the board shall hold meetings at such times and places within the State as shall, in the judgment of the members afford the best facilities to the greatest number of probable candidates. Special meetings may also be called, whenever, for any reason, it may become necessary to appoint one or more inspectors. Public notice shall be given through the press or otherwise, announcing the time and place at which examinations are to be held.

RULES OF PROCEDURE.—(e) The examinations herein provided for shall be conducted under such rules, conditions and regulations as the members of the board shall deem most efficient for carrying into effect the spirit and intent of this Act. Such rules, when formulated, shall be made a part of the permanent record of the board, and such of them as relate to candidates shall be published for their information, and governance prior to each examination; they shall also be of uniform application to all candidates.

EXAMINATIONS.

SEC. 7. FOR INSPECTORS.—(a) Persons coming before the State Mining Board as candidates for appointment as State inspectors of mines must produce evidence satisfactory to the board that they are citizens of this State, at least thirty years of age, that they have had a practical mining experience of ten years, and that they are men of good repute and temperate habits; they must also submit to and satisfactorily pass an examination as to their practical and technical knowledge of mining engineering and mining machinery and appliances, of the proper development and operation of coal mines, of ventilation in mines, of the nature and properties of mine gases, of the geology of the coal measures in this State, and of the laws of this State relating to coal mines.

NAMES CERTIFIED TO THE GOVERNOR.—(b) At the close of each examination for inspectors the board shall certify to the Governor the names of all candidates who have received a rating above the minimum fixed by the rules of the board as properly qualified for the duties of inspectors.

INSPECTORS APPOINTED.—(c) From those named, the Governor shall select and appoint ten State inspectors of mines; that is to say, one inspector for each of the ten inspection districts provided for in this Act; or more, if, in the future, additional inspection districts shall be created, and their commissions shall be for a term of two years from October first: Provided, that any one who has satisfactorily passed two of the State examinations for inspectors, and who has served acceptably as State inspector for two full terms, upon making written application to the board setting forth the facts, shall also be certified to the Governor as a person properly qualified for appointment; but no man shall be eligible for appointment as a State inspector of mines who has any pecuniary interest in any coal mine, either as owner or employee.

FOR MINE MANAGERS.—(d) Persons coming before the board for certificates of competency as mine managers must produce evidence satisfactory to the board that they are citizens of the State of Illinois, at least twenty-four years of age, that they have had at least four years' practical mining experience, and that they are men of good repute and temperate habits; they must also submit to and satisfactorily pass such an examination as to their experience in mines and in the management of men, their knowledge of mine machinery and appli-

ances, the use of surveying and other instruments, the properties of mine gases, the principles of ventilation and the specific duties and responsibilities of mine managers, as the board shall see fit to impose.

FOR HOISTING ENGINEER.—(e) Persons seeking certificates of competency as hoisting engineers must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-one years of age, that they have had at least two years' experience as fireman or engineer of a hoisting plant, and are of good repute and temperate habits. They must be prepared to submit to and satisfactorily pass an examination as to their experience in handling hoisting machinery, and as to their practical and technical knowledge of the construction, cleaning and care of steam boilers, the care and adjustment of hoisting engines, the management and efficiency of pumps, ropes and winding apparatus, and their knowledge of the laws of this State in relation to signals and the hoisting and lowering of men at mines.

FOR MINE EXAMINERS.—(f) Persons seeking certificates of competency as mine examiners must produce evidence satisfactory to the board that they are citizens of the State of Illinois, at least twenty-one years of age, and of good repute and temperate habits. They must be prepared to submit to and satisfactorily pass an examination as to their experience in mines generating dangerous gases, their practical and technical knowledge of the nature and properties of fire-damp, the laws of ventilation, the structure and use of safety lamps, and the laws of this State relating to safeguards against fires from any source in mines.

SEC. 8. CERTIFICATES ISSUED BY THE BOARD.—(a) The certificates provided for in this Act shall be issued under the signature and seal of the State Mining Board, to all those who receive a rating above the minimum fixed by the rules of the board; such certificates shall contain the full name, age and place of birth of the recipient and the length and nature of his previous service in or about coal mines.

RECORD TO BE PRESERVED.—(b) The board shall make and preserve a record of the names and addresses of all persons to whom certificates are issued.

EFFECT OF CERTIFICATES.—(c) The certificates provided for in this Act shall entitle the holders thereof to accept and discharge the duties for which they are hereby declared qualified, at any mine in this State, where their services may be desired.

FOREIGN CERTIFICATES.—(d) The board may exercise its discretion in issuing certificates of any class, but not without examination, to persons presenting, with proper credentials, certificates issued by competent authority in other states.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE MANAGERS.—(e) It shall be unlawful for the operator of any coal mine to employ, or suffer to serve, as mine manager at his mine, any person who does not hold a certificate of competency issued by a duly authorized board of examiners of this State: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certificated mine manager, he may place any trustworthy and experienced man, subject to the approval of the State inspector of the district, in charge of his mine to act as temporary mine manager for a period not exceeding thirty days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED HOISTING ENGINEERS.—(f) It shall be unlawful for the operator of any mine to employ, or suffer to serve, as hoisting engineer for said mine, any person who does not hold a certificate of competency issued by a duly authorized board of examiners of this State, or to permit any other to operate his hoisting engine except for the purpose of

learning to operate it, and then only in the presence of the certificated engineer in charge, and when men are not being hoisted, or lowered: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certificated hoisting engineer, he may place any trustworthy and experienced man, subject to the approval of the State inspector of the district, in charge of his engines, to act as temporary engineer, for a period not to exceed thirty days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE EXAMINERS.—(g) It shall be unlawful for the operator of any mine to employ, or suffer to serve, as mine examiner, any person who does not hold a certificate of competency issued by the State Mining Board: Provided, that any one holding a mine manager's certificate may serve as mine examiner, and, whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certificated mine examiner, he may employ any trustworthy and experienced man, subject to the approval of the State inspector of the district, to act as temporary mine examiner for a period not to exceed thirty days. The employment of persons who do not hold certificates as mine managers, hoisting engineers, and mine examiners, shall in no case exceed the limit of time specified herein, and the State inspector shall not approve of the employment of such persons beyond the thirty day limit.

CANCELLATION OF CERTIFICATES.—(h) The certificates of any mine manager, hoisting engineer or mine examiner, may be cancelled and revoked by the State Mining Board whenever it shall be established to the satisfaction of said board that the holder thereof has become unworthy of official endorsement, by reason of violations of the law, intemperate habits, manifest incapacity, abuse of authority, or for other causes satisfactory to said board: Provided, that any person against whom charges or complaints are made shall have an opportunity to be heard in his own behalf. And he shall have thirty days' notice in writing of such charges.

CREDENTIALS.

SEC. 9. An application (applicant) for any certificate herein provided for, before being examined, shall register his name with the secretary of the board, and file with him the credentials required by this Act, to wit: An affidavit as to all matters of fact establishing his right to receive the examination, and a certificate of good character and temperate habits signed by at least ten of the citizens who know him best in the place in which he lives.

* * * * *

NOTE.—The amended sections 18 and 19 are under the appropriate title, Mining Operations, and the subtitle, State Mining Board—Seventh Amendatory Act. See page 205.

REVISED ACT—STATE MINING BOARD.

LAWS 1911, P. 286.

JUNE 6, 1911.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Sections 1 to 6, inclusive, are included under this title. The remaining sections are under the appropriate title, Third General Revision, 1911, page 212.

SECTION 1. Be it enacted etc.: (a) That the Governor, with the advice and consent of the Senate, shall appoint a State Mining Board which shall be composed of five members, two of whom shall be practicing coal miners, one a practicing coal mine hoisting engineer, and two coal operators.

POWERS AND DUTIES OF BOARD.—(b) Said board shall be authorized, empowered and required to make formal inquiry into and pass upon the practical and technological qualifications and personal fitness of men seeking appointments as State inspectors of mines, and of those seeking certificates of com-

petency as mine managers, as hoisting engineers and as mine examiners. Said board also shall have such other powers and duties as may be prescribed by the provisions of this Act, or any other Act relating to coal mining. Said board also shall control and direct the State mine inspectors hereinafter provided for, in the discharge of their duties. Said board also shall cause to be collected statistical details relating to coal mining in the State, especially in its relations to the vital, sanitary, commercial and industrial conditions, and to the permanent prosperity of said industry; and said board shall cause such statistical details to be compiled and summarized as a report of said State Mining Board, to be known as the Annual Coal Report.

DATE AND TERM OF APPOINTMENT.—(c) Their appointment shall date from July 1, 1911, and they shall serve for a term of two years, or until their successors are appointed and qualified. They shall all be sworn to a faithful performance of their duties. One of the coal operators member of said board shall be elected as president, and one of the coal miners members of said board shall be elected as secretary. The board may appoint a chief clerk and may employ such other persons as may be necessary for the proper discharge of its powers and duties; all of whom shall perform such duties as may be prescribed by the board from time to time, and the board may from time to time also prescribe standing and other rules for the control and direction of its offices and employees and of the State mine inspectors.

SUPPLIES FURNISHED BY SECRETARY OF STATE.—(d) The Secretary of State shall assign to the use of the board, suitably furnished rooms in the State House, and shall also furnish whatever blanks, blank books, printing, stationery, instruments and supplies the board may require in the discharge of its duties, and for the use of State mine inspectors.

FREQUENCY OF MEETINGS.—(e) The board shall hold such meetings from time to time as may be necessary for the proper discharge of its duties. The board shall meet at the Capitol on the second Tuesday in September of the year 1911, and annually thereafter, for the examination of candidates for appointment as State inspectors of mines. Special examinations also may be held whenever for any reason it may become necessary to appoint one or more inspectors.

For the examination of persons seeking certificates of competency as mine managers, hoisting engineers and mine examiners, the board shall hold meetings at such times and places within the State as shall, in the judgment of the members, afford the best facilities to the greatest number of candidates.

Public notice shall be given through the press or otherwise, not less than ten days in advance, announcing the time and place at which any examinations under this section are to be held.

RULES OF PROCEDURE.—(f) The examinations herein provided for shall be conducted under rules, conditions and regulations prescribed by the board. Such rules shall be made a part of the permanent record of the board, and such of them as relate to candidates shall be, upon application of any candidate, furnished to him by the board; they shall also be of uniform application to all candidates.

COMPENSATION OF MEMBERS—SALARY OF CHIEF CLERK.—(g) The members of the State Mining Board shall receive as compensation for their services the sum of five dollars (\$5) each per day for a term not exceeding one hundred (100) days in any one year, and whatever sums are necessary to reimburse them for such actual and necessary traveling expenses as may be incurred in the discharge of their duties.

The salary of the chief clerk shall be \$2,000 per annum and he shall be reimbursed for any amounts expended for actual and necessary travelling expenses in the discharge of his duties.

All salaries and expenses of the board and of its employes shall be paid upon vouchers duly sworn to by each and approved by the president of the board, or in his absence by the acting president, and by the Governor, and the Auditor of Public Accounts is hereby authorized to draw his warrants on the State treasury (Treasurer) for the amounts thus shown to be due, payable out of any money in the treasury not otherwise appropriated.

SEC. 2. CREDENTIALS.—(a) An applicant for any certificate herein provided for, before being examined, shall register his name with the State Mining Board and file with the board the credentials required by this Act, to wit: An affidavit as to all matters of fact establishing his right to receive the examination, and a certificate of good character and temperate habits, signed by at least ten residents of the community in which he resides.

EXAMINATIONS FOR INSPECTORS.—(b) Persons applying to the State Mining Board as candidates for appointment as State inspectors of mines must produce evidence satisfactory to the board that they are citizens of this State, at least thirty years of age, that they have had a practical mining experience of ten years, and that they are men of good repute and temperate habits; they must pass an examination as to their practical and technological knowledge of mine surveying and mining machinery and appliances, of the proper development and operation of coal mines, of ventilation in mines, of the nature and properties of mine gases, of first aid to injured, of mine rescue methods and appliances, of the geology of the coal measures in this State, and of the laws of this State relating to coal mines.

NAMES CERTIFIED TO THE GOVERNOR.—(c) At the close of each examination for inspectors the board shall certify to the Governor the names of all candidates who have received a rating above the minimum fixed by the rules of the board as being persons properly qualified for the position of inspector.

EXAMINATIONS FOR MINE MANAGERS.—(d) Persons applying to the board for certificates of competency as mine managers must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-four years of age, that they have had at least four years' practical mining experience, and that they are men of good repute and temperate habits; they must also pass such examination as to their experience in mines and in the management of men, their knowledge of mine machinery and appliances, the use of surveying and other instruments used in mining, the properties of mine gases, the principles of ventilation, of first aid to injured, of mine rescue methods and appliances, and the legal duties and responsibilities of mine managers, as shall be prescribed by the rules of the board.

FOR MINE MANAGERS, SECOND CLASS.—(d) Persons coming before the board for certificates of competency as mine managers, second class, must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-four years of age, that they have had at least four years' practical mining experience, and that they are men of good repute and temperate habits; they must also submit to and satisfactorily pass such an examination as to their experience in mines and in the management of men, their knowledge of coal mining, mine ventilation and the mining laws of this State and the required duties and responsibilities of second class mine managers, as shall be prescribed by the rules of the board, and it shall be unlawful to employ second-class mine managers, or for them to serve in that capacity at mines employing more than ten men.

EXAMINATIONS FOR MINE EXAMINERS.—(e) Persons applying to the board for certificates of competency as mine examiners, must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-one years of age, and of good repute and temperate habits, and that they have

and at least four years' practical mining experience. They must pass an examination as to their experience in mines generating dangerous gases, their practical and technological knowledge of the nature and properties of fire-lamp, the laws of ventilation, the structure and uses of safety lamps, and the laws of this State relating to safeguards against fires from any source in mines.

EXAMINATIONS FOR HOISTING ENGINEERS.—(f) Persons applying to the board for certificates of competency as hoisting engineers must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-one years of age, that they have had at least two years' experience as fireman or engineer of a hoisting plant, and are of good repute and temperate habits. They must pass an examination as to their experience in handling hoisting machinery, and as to their practical and technological knowledge of the construction, cleaning and care of steam boilers, the care and adjustment of hoisting engines, the management and efficiency of pumps, ropes and winding apparatus, and as to their knowledge of the laws of this State in relation to signals and the hoisting and lowering of men at mines.

EXAMINATION PAPERS PRESERVED.—(g) There shall be a written and an oral examination of applicants as may be prescribed by the rules of the board; and all written examination papers and all other papers of applicants shall be kept on file by the board for not less than one year, during which time any applicant shall have the right to inspect his said papers at all reasonable times; and any applicant shall be entitled to a certified copy of any or all of his said papers upon payment of a reasonable copy fee therefor.

SEC. 3. CERTIFICATES ISSUED BY THE BOARD.—(a) The certificates provided for in this Act shall be issued under the signature and seal of the State Mining Board, to all those who receive a rating above the minimum fixed by the rules of the board; such certificates shall contain the full name, age and place of birth of the recipient and the length and nature of his previous service in or about coal mines.

RECORD TO BE PRESERVED.—(b) The board shall make and preserve a record of the names and addresses of all persons to whom certificates are issued.

EFFECT OF CERTIFICATES.—(c) The certificates provided for in this Act shall entitle the holders thereof to accept and discharge at any mine in this State, the duties for which they are declared qualified.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE MANAGERS.—(d) It shall be unlawful for the operator of any coal mine to have in his service as mine manager at his mine, any person who does not hold a certificate of competency issued by the State Mining Board of this State: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certified mine manager, he may place any trustworthy and experienced man of the mine inspection district in charge of his mine to act as temporary mine manager for a period not exceeding seven days, and with the approval of the State Inspector of the district, for a further period not exceeding twenty-three days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE EXAMINERS.—(e) It shall be unlawful for the operator of any coal mine to have in his service as examiner any person who does not hold a certificate of competency issued by the State Mining Board: Provided, that any one holding a mine manager's certificate may serve as mine examiner; but in any mine employing more than twenty-five (25) men, the mine manager shall not act in the capacity of mine examiner while acting as mine manager: And, Provided, whenever an exigency arises by which it is impossible for any operator to secure the immediate services of a certificated examiner, he may employ any trustworthy and

experienced man of the mine inspection district to act as temporary mine examiner for a period not exceeding seven days, and with the approval of the State inspector of the district, for a further period not exceeding twenty-three days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED HOISTING ENGINEER.—

(f) It shall be unlawful for the operator of any mine to permit any person who does not hold a certificate of competency as hoisting engineer issued by the State Mining Board, to hoist or lower men, or to have charge of the hoisting engine when men are underground.

TEMPORARY EMPLOYMENT OF UNCERTIFICATED PERSONS NOT EXTENDED.—(g)

The employment of persons who do not hold certificates as mine managers and mine examiners, shall in no case exceed the limit of time specified herein, and the State inspector shall not approve of the employment of such persons beyond the twenty-three day limit.

REMOVAL OF INSPECTORS.—(h) Upon a petition signed by not less than three coal operators, or ten coal miners, setting forth that any State inspector of mines neglects his duties, or that he is incompetent, or that he is guilty of malfeasance in office, or guilty of any act tending to the unlawful injury of miners or operators of mines, it shall be the duty of the State Mining Board to issue a citation to the said inspector to appear before it within a period of fifteen days on a day fixed for said hearing, when the said board shall investigate the allegations of the petitioners; and if the said board shall find that the said inspector is neglectful of his duty, or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, the said board shall declare the office of said inspector vacant, and a properly qualified person shall be duly appointed, in the manner provided for in this Act, to fill said vacancy.

CANCELLATION OF CERTIFICATES.—(i) The certificate of any mine manager, hoisting engineer or mine examiner, may be canceled and revoked by the State Mining Board upon notice and hearing as hereinafter provided, if it shall be established in the judgment of said board that the holder thereof has become unworthy to hold said certificate by reason of violation of the law, intemperate habits, incapacity, abuse of authority or for any other cause: Provided, that any person against whom charges or complaints are made hereunder shall have the right to appear before said board and defend against said charges, and he shall have fifteen day's notice in writing of such charges previous to such hearing: Provided, further, that the board in its discretion may suspend the certificate of any person charged as aforesaid, pending said hearing, but said hearing shall not be unreasonably deferred.

SEC. 4. INSPECTION DISTRICTS.—The State shall be divided into twelve inspection districts, said divisions to be made by the State Mining Board. The board may also change from time to time the boundaries of said districts, in order to more equally distribute the labor and expense of the several mine inspectors, but this provision shall not be construed as authorizing the State Mining Board to increase the number of districts.

SEC. 5. INSPECTORS APPOINTED.—(a) From the names certified by the State Mining Board, the Governor shall select and appoint twelve State mine inspectors; that is to say, one inspector for each of the twelve inspection districts provided for in this Act; or more, if, in the future, additional inspection districts shall be created, and their commissions shall be for a term of two years from July first, provided the term of any State mine inspector in office July 1, 1911, shall be extended to October 1, 1911, and provided any State inspector in actual service and good standing and who has passed one examination under this Act may be reappointed for the next ensuing term, without further certification, but

shall not be so reappointed more than three times: Provided, further, no man shall be eligible for appointment as a State inspector of mines who has any pecuniary interest in any coal mine in Illinois.

(b) The county board of supervisors, or of commissioners in counties not under township organization, or any county in which coal is produced, upon the written request of the State Inspector of Mines for the district in which said county is located, shall appoint a county inspector of mines as assistant to such State inspector, but no person shall be eligible for appointment as county inspector who does not hold a State certificate of competency as mine manager, and the compensation of such county inspector shall be fixed by the county board at not less than three dollars per day, to be paid out of the county treasury.

The State inspector may authorize any county inspector in his district to assume and discharge all the duties and exercise all the powers of a State inspector in the county for which he is appointed, in the absence of the State inspector; but such authority must be conferred in writing and the county inspector must produce the same as evidence of his powers upon the demand of any person affected by his acts; and the bond of said State inspector shall be holden for the faithful performance of the duties of such assistant inspector.

BOND.—(c) State inspectors, before entering upon their duties as such, must take an oath of office, as provided for by the Constitution, and enter into a bond to the State in the sum of five thousand dollars (\$5,000) for State mine inspectors, with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular, as required by this Act. Said bonds, with the approval of the Governor endorsed thereon, together with the oath of office, shall be deposited with the Secretary of State.

INSTRUMENTS.—(d) The State Mining Board shall furnish to each of said State inspectors an anemometer, a safety-lamp and such other instruments and such blanks, blank-books, stationery, printing and supplies as may be required by said inspectors in the discharge of their official duties. Said instruments and supplies shall be paid for on bills of particulars certified by the proper officers of the board and approved by the Governor; and the Auditor of Public Accounts shall draw his warrants on the State treasury (Treasurer) for the amounts thus shown to be due, payable out of any money in the treasury not otherwise appropriated.

EXAMINATION OF MINES.—(e) State inspectors shall devote their whole time and attention to the duties of their respective offices. State inspectors shall make personal examination at least once in every six months of each mine in their district in which marsh gas has been detected in quantities which, in the judgment of the State Mining Board, is dangerous. The State Mining Board also may require State inspectors personally to examine any or all other mines in their respective districts. State inspectors may be assigned by the State Mining Board to examine mines which have not been classified as generating marsh gas in dangerous quantities. Every mine in the State shall be examined at least once in every six months.

SCOPE OF EXAMINATION.—(f) Every State inspector in the regular inspection of mines shall measure with an anemometer and determine the amount of air passing in the last cross-cut in each pair of entries in pillar and room mines, or in the last room of each division in longwall mines. He shall also measure with an anemometer and determine the amount of air passing at the inlet and outlet of the mines; and he shall compare all such air measurements with the last report of the mine examiner and the mine manager upon the mine examination book of the mine. He must observe that the legal code of signals between the engineer and the top man and bottom man is established and conspicuously posted for the information of all employees.

State inspectors also shall require that every necessary precaution be taken to insure the health and safety of the workmen employed in the mines, and that the provisions and requirements of all the mining laws of this State are obeyed.

State inspectors shall render written reports of mine inspections made by them to the State Mining Board in such form and manner as shall be required by the board. State Inspector(s) shall take prompt action for the enforcement of the penalties provided for violation of the mining laws.

AUTHORITY TO ENTER.—(g) It shall be lawful for State inspectors to enter, examine and inspect any and all coal mines and the machinery belonging thereto, at all reasonable times, by day or by night, but so as not to unreasonably obstruct or hinder the working of such coal mine, and the operator of every such coal mine is hereby required to furnish all necessary facilities for making such examination and inspection.

PROCEDURE IN CASE OF OBJECTION.—(h) If any operator shall refuse to permit such inspection or to furnish the necessary facilities for making such examination and inspection, the inspector shall file his affidavit, setting forth such refusal, with the judge of the circuit court in said county in which said mine is situated, either in term time or vacation, or, in the absence of said judge, with a master in chancery in said county, in which said mine is situated, and obtain an order on such owner, agent or operator so refusing as aforesaid, commanding him to permit and furnish such necessary facilities for the inspection of such coal mine, or to be adjudged to stand in contempt of court and punished accordingly.

NOTICES TO BE POSTED.—(i) The State inspector shall post in some conspicuous place at the top of each mine inspected by him, a plain statement showing what in his judgment is necessary for the better protection of the lives and health of persons employed in such mine; such statement shall give the date of inspection and be signed by the inspector. He shall post a notice at the landing used by the men, stating what number of men will be permitted to ride on the cage at one time and the rate of speed at which men may be hoisted and lowered on the cages.

NOTE.—Clauses (j) and (k) are under the title *Mine Inspectors*, page 49.

INSPECTORS' ANNUAL REPORTS.—(l) Each State inspector of mines shall, within sixty days after June 30th of each year, prepare and forward to the State Mining Board a formal report of his acts during the year in the discharge of his duties, with any recommendations as to legislation he may deem necessary on the subject of mining, and shall collect and tabulate upon blanks furnished by said board all desired statistics of mines and miners within his district to accompany said annual report.

REPORTS TO BE PUBLISHED.—(m) On the receipt of said inspectors' reports the chief clerk of the State Mining Board shall compile and summarize the same, to be included in the report of said board, to be known as the Annual Coal Report which shall, within four months thereafter, be bound, printed and transmitted to the Governor for the information of the General Assembly and the public. The printing and binding of said reports shall be provided for by the Commissioners of State Contracts in like manner and in like numbers as they provide for the publication of other official reports to the Governor.

REPORTS BY OPERATOR.—(n) Every coal operator shall, within thirty days after June 30 of each year, furnish to the State mine inspector of the district, on blanks furnished by him prior to said June 30, statistics of the wages and conditions of their employes as required by law. The failure of any inspector to forward to the State Mining Board his formal report, as provided in paragraph [one] (1) hereof, or the failure of any coal operator to furnish to the

State Mine Inspector of the district the statistics provided for herein, shall be adjudged a misdemeanor and be subject to a fine of \$100.

SEC. 6. PAY OF INSPECTORS.—Each State Inspector of mines shall receive as compensation for his services the sum of \$1,800 per annum, and for traveling and other necessary expenses each shall receive the sum actually expended for that purpose in the discharge of his official duties: Provided, such expenses shall not exceed one hundred dollars (\$100) per calendar month for each State inspector of mines, both salary and expenses to be paid monthly by the State Treasurer, on warrants of the Auditor of Public Accounts, from the funds in the treasury not otherwise appropriated; said expense vouchers shall show the items of expenditures in detail, with sub-vouchers for the same so far as it is practicable to obtain them. Said vouchers shall be sworn to by the Inspector and be approved by the president of the State Mining Board and the Governor.

FIRST AMENDATORY ACT.

LAW 1912, P. 412.

JUNE 27, 1912.

AN ACT to amend sections 1, 2, 3, 5, 6, 10, 11, 14, 16, 18, 19, 20, and 21 of An Act entitled "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911.

SECTION 1. Be it enacted, etc.:

That sections 1, 2, 3, 5, 6, 10, 11, 14, 16, 18, 19, 20, and 21 of An Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, be and the same are hereby amended so as to read as follows:

SEC. 1. (a) That the Governor, with the advice and consent of the Senate, shall appoint a State Mining Board which shall be composed of five members, two of whom shall be practical coal miners, one a practicing coal mine hoisting engineer, and two coal operators.

POWERS AND DUTIES OF BOARD.—(b) Said board shall be authorized, empowered and required to make formal inquiry into and pass upon the practical and technological qualifications and personal fitness of men seeking appointment as State Inspectors of Mines, and of those seeking certificates of competency as mine managers, as hoisting engineers and as mine examiners. Said board also shall have such other powers and duties as may be prescribed by the provisions of this Act, or any other Act relating to coal mining. Said Board also shall control and direct the State mine inspectors hereinafter provided for, in the discharge of their duties, and shall have the power and shall in person and through the State Mine Inspectors see that all the provisions of the State mining law are enforced. Said board also shall cause to be collected statistical details relating to coal mining in the State, especially in its relations to the vital, sanitary, commercial and industrial conditions, and to the permanent prosperity of said industry; and said board shall cause such statistical details to be compiled and summarized as a report of said State Mining Board, to be known as the Annual Coal Report.

DATE AND TERM OF APPOINTMENT.—(c) Their appointment shall date from July 1, 1911, and they shall serve for a term of two years or until their successors are appointed and qualified. They shall all be sworn to a faithful performance of their duties. One of the coal operators member of said board shall be elected as president, and one of the coal miners member of said board shall be elected as secretary. The board may appoint a chief clerk and may employ such other persons as may be necessary for the proper dis-

charge of its powers and duties; all of whom shall perform such duties as may be prescribed by the board from time to time, and the board may from time to time also prescribe standing and other rules for the control and direction of its officers and employees and of the State mine inspectors.

SUPPLIES FURNISHED BY SECRETARY OF STATE.—(d) The Secretary of State shall assign to the use of the board, suitably furnished rooms in the State House, and shall also furnish whatever blanks, blank books, printing, stationery, instruments and supplies the board may require in the discharge of its duties, and for the use of State mine inspectors.

FREQUENCY OF MEETINGS.—(e) The board shall hold such meetings from time to time as may be necessary for the proper discharge of its duties. The board shall meet at the Capitol on the second Tuesday in September of the year 1911, and annually thereafter, for the examination of candidates for appointment as State inspectors of mines. Special examinations also may be held whenever for any reason it may be come necessary to appoint one or more inspectors.

For the examination of persons seeking certificates of competency as mine managers, hoisting engineers and mine examiners, the board shall hold meetings at such times and places within the State as shall, in the judgment of the members, afford the best facilities to the greatest number of candidates.

Public notice shall be given through the press or otherwise, not less than ten days in advance, announcing the time and place at which any examinations under this section are to be held.

RULES OF PROCEDURE.—(f) The examinations herein provided for shall be conducted under rules, conditions and regulations prescribed by the board. Such rules shall be made a part of the permanent record of the board, and such of them as relate to candidates shall be, upon application of any candidate, furnished to him by the board; they shall also be of uniform application to all candidates.

COMPENSATION OF MEMBERS—SALARY OF CHIEF CLERK.—(g) The members of the State Mining Board shall receive as compensation for their services the sum of five dollars (\$5) each per day for a term not exceeding one hundred (100) days in any one year, and whatever sums are necessary to reimburse them for such actual and necessary traveling expenses as may be incurred in the discharge of their duties.

The salary of the chief clerk shall be \$2,000 per annum, and he shall be reimbursed for any amounts expended for actual and necessary traveling expenses in the discharge of his duties.

All salaries and expenses of the board and of its employees shall be paid upon vouchers duly sworn to by each and approved by the president of the board, or in his absence by the acting president, and by the Governor, and the Auditor of Public Accounts is hereby authorized to draw his warrants on the State treasury for the amounts thus shown to be due, payable out of any money in the treasury not otherwise appropriated.

SEC. 2. CREDENTIALS.—(a) An applicant for any certificate herein provided for, before being examined, shall register his name with the State Mining Board and file with the board the credentials required by this Act, to-wit: An affidavit as to all matters of fact establishing his right to receive the examination, and a certificate of good character and temperate habits, signed by at least ten residents of the community in which he resides.

EXAMINATIONS FOR INSPECTORS.—(b) Persons applying to the State Mining Board as candidates for appointment as State inspectors of mines must produce evidence satisfactory to the board that they are citizens of this State, at least thirty years of age, that they have had a practical mining experience of ten

years, and that they are men of good repute and temperate habits; they must pass an examination as to their practical and technological knowledge of mine surveying and mining machinery and appliances, of the proper development and operation of coal mines, of ventilation in mines, of the nature and properties of mine gases, of first aid to injured, of mine rescue methods and appliances, of the geology of coal measures in this State, and of the laws of this State relating to coal mines.

NAMES CERTIFIED TO THE GOVERNOR.—(c) At the close of each examination for inspectors the board shall certify to the Governor the names of all candidates who have received a rating above the minimum fixed by the rules of the board as being persons properly qualified for the position of inspector.

EXAMINATIONS FOR MINE MANAGERS.—(d) Persons applying to the board for certificates of competency as mine managers must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-four years of age, that they have had at least four years' practical mining experience, and that they are men of good repute and temperate habits; they must also pass such examination as to their experience in mines and in the management of men, their knowledge of mine machinery and appliances, the use of surveying and other instruments used in mining, the properties of mine gases, the principles of ventilation, of first aid to injured, of mine rescue methods and appliances, and the legal duties and responsibilities of mine managers, as shall be prescribed by the rules of the board.

FOR MINE MANAGERS, SECOND CLASS.—(d) Persons coming before the board for certificates of competency as mine managers, second class, must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-four years of age, that they have had at least four years' practical mining experience, and that they are men of good repute and temperate habits; they must also submit to and satisfactorily pass such an examination as to their experience in mines and in the management of men, their knowledge of coal mining, mine ventilation and the mining laws of this State and the required duties and responsibilities of second class mine managers, as shall be prescribed by the rules of the board, and it shall be unlawful to employ second-class mine managers, or for them to serve in that capacity at mines employing more than ten men.

EXAMINATIONS FOR MINE EXAMINERS.—(e) Persons applying to the board for certificates of competency as mine examiners, must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-one years of age, and of good repute and temperate habits, and that they have had at least four years' practical mining experience. They must pass an examination as to their experience in mines generating dangerous gases, their practical and technological knowledge of the nature and properties of fire-damp, the laws of ventilation, the structure and uses of safety lamps, and the laws of this State relating to safeguards against fires from any source in mines. They shall also possess a knowledge of first aid to injured and of mine-rescue methods, and shall hold a certificate from any national or State commission or bureau or other recognized agency.

EXAMINATIONS FOR HOISTING ENGINEERS.—(f) Persons applying to the board for certificates of competency as hoisting engineers must produce evidence satisfactory to the board that they are citizens of the United States, at least twenty-one years of age, that they have had at least two years' experience as fireman or engineer of a hoisting plant, and are of good repute and temperate habits. They must pass an examination as to their experience in handling hoisting machinery, and as to their practical and technological knowledge of

the construction, cleaning and care of steam boilers, the care and adjustment of hoisting engines, the management and deficiency of pumps, ropes and winding apparatus, and as to their knowledge of the laws of this State in relation to signals and the hoisting and lowering of men at mines.

EXAMINATION PAPERS PRESERVED.—(g) There shall be a written and an oral examination of applicants as may be prescribed by the rules of the board; and all written examination papers and all other papers of applicants shall be kept on file by the board for not less than one year, during which time any applicant shall have the right to inspect his said papers at all reasonable times; and any applicant shall be entitled to a certified copy of any or all of his said papers upon payment of a reasonable copy fee therefor.

SEC. 3. CERTIFICATES ISSUED BY THE BOARD.—(a) The certificates provided for in this Act shall be issued under the signature and seal of the State Mining Board, to all those who receive a rating above the minimum fixed by the rules of the board; such certificates shall contain the full name, age and place of birth of the recipient and the length and nature of his previous service in or about coal mines.

RECORD TO BE PRESERVED.—(b) The board shall make and preserve a record of the names and addresses of all persons to whom certificates are issued.

EFFECT OF CERTIFICATES.—(c) The certificates provided for in this Act shall entitle the holders thereof to accept and discharge at any mine in this State, the duties for which they are declared qualified.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE MANAGERS.—(d) It shall be unlawful for the operator of any coal mine to have in his service as mine manager at his mine, any person who does not hold a certificate of competency issued by the State Mining Board of this State: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certificated mine manager, he may place any trustworthy and experienced man of the mine inspection district in charge of his mine to act as temporary mine manager for a period not exceeding seven days, and with the approval of the State Inspector of the district, for a further period not exceeding twenty-three days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE EXAMINERS.—(e) It shall be unlawful for the operator of any mine to have in his service as mine examiner any person who does not hold a certificate of competency issued by the State Mining Board: Provided, that any one holding a mine managers' certificate may serve as mine examiner; but in any mine employing more than twenty-five (25) men, the mine manager shall not act in the capacity of mine examiner while acting as mine manager: And, provided, whenever an exigency arises by which it is impossible for any operator to secure the immediate services of a certificated examiner, he may employ any trustworthy and experienced man of the mine-inspection district to act as temporary mine examiner for a period not exceeding seven days, and with the approval of the State Inspector of the district, for a further period not exceeding twenty-three days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED HOISTING ENGINEER.—(f) It shall be unlawful for the operator of any mine to permit any person who does not hold a certificate of competency as hoisting engineer issued by the State Mining Board, to hoist or lower men, or to have charge of the hoisting engine when men are underground.

TEMPORARY EMPLOYMENT OF UNCERTIFICATED PERSONS NOT EXTENDED.—(g) The employment of persons who do not hold certificates as mine managers and mine examiners shall in no case exceed the limit of time specified herein, and the

State inspector shall not approve of the employment of such persons beyond the twenty-three day limit.

REMOVAL OF INSPECTORS.—(h) Upon a petition signed by not less than three coal operators, or ten coal miners, setting forth that any State inspector of mines neglects his duties, or that he is incompetent, or that he is guilty of malfeasance in office, or guilty of any act tending to the unlawful injury of miners or operators of mines, it shall be the duty of the State Mining Board to issue a citation to the said inspector to appear before it within a period of fifteen days on a day fixed for said hearing, when the said board shall investigate the allegations of the petitioners; and if the said board shall find that the inspector is neglectful of his duty or is incompetent or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, the said board shall declare the office of said inspector vacant, and a properly qualified person shall be duly appointed, in the manner provided for in this Act, to fill said vacancy.

CANCELLATION OF CERTIFICATES.—(i) The certificate of any mine manager, hoisting engineer or mine examiner may be cancelled and revoked by the State Mining Board upon notice and hearing as hereinafter provided, if it shall be established in the judgment of said board that the holder thereof has become unworthy to hold said certificate by reason of violation of the law, intemperate habits, incapacity, abuse of authority or for any other cause: Provided, that any person against whom charges or complaints are made hereunder shall have the right to appear before said board and defend against said charges, and he shall have fifteen days' notice in writing of such charges previous to such hearing: Provided, further, that the board in its discretion may suspend the certificate of any person charged as aforesaid, pending such hearing, but said hearing shall not be unreasonably deferred.

SEC. 5. INSPECTORS APPOINTED.—(a) From the names certified by the State Mining Board, the Governor shall select and appoint twelve State mine inspectors; that is to say, one inspector for each of the twelve inspection districts provided for in this Act; or more, if, in the future, additional inspection districts shall be created, and their commissions shall be for a term of two years from July 1, provided the term of any State mine inspector in office July 1, 1911, shall be extended to Oct. 1, 1911, and provided any State inspector in actual service and good standing and who has passed one examination under this Act may be reappointed for the next ensuing term, without further certification, but shall not be so reappointed more than three times: Provided, further, no man shall be eligible for appointment as a State inspector of mines who has any pecuniary interest in any coal mine in Illinois.

(b) The county board of supervisors, or of commissioners in counties not under township organization, of any county in which coal is produced, upon the written request of the State Inspector of Mines for the district in which said county is located, shall appoint a county inspector of mines as assistant to such State inspector, but no person shall be eligible for appointment as county inspector who does not hold a State certificate of competency as mine manager, and the compensation of such county inspector shall be fixed by the county board at not less than three dollars per day, to be paid out of the county treasury.

The State inspector may authorize any county inspector in his district to assume and discharge all the duties and exercise all the powers of a State inspector in the county for which he is appointed, in the absence of the State inspector; but such authority must be conferred in writing and the county

inspector must produce the same as evidence of his powers upon the demand of any person affected by his acts; and the bond of said State inspector shall be holden for the faithful performance of the duties of such assistant inspector.

BOND.—(c) State inspectors, before entering upon their duties as such, must take an oath of office, as provided for by the Constitution, and enter into a bond to the State in the sum of five thousand dollars (\$5,000) for State mine inspectors, with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular, as required by this Act. Said bonds, with the approval of the Governor endorsed thereon, together with the oath of office, shall be deposited with the Secretary of State.

INSTRUMENTS.—(d) The State Mining Board shall furnish to each of said State inspectors an anemometer, a safety-lamp and such other instruments and such blanks, blank-books, stationery, printing and supplies as may be required by said inspectors in the discharge of their official duties. Said instruments and supplies shall be paid for on bills of particulars certified by the proper officers of the board and approved by the Governor; and the Auditor of Public Accounts shall draw his warrants on the State treasury for the amounts thus shown to be due, payable out of any money in the treasury not otherwise appropriated.

EXAMINATION OF MINES.—(e) State inspectors shall devote their whole time and attention to the duties of their respective offices. State inspectors shall make personal examination at least once in every six months or oftener if necessary, of each mine in their district in which ten or more men are employed. The State Mining Board also may require State inspectors personally to examine any or all other mines in their respective districts. Every mine in the State shall be examined at least once in every six months by either a State or county mine inspector.

SCOPE OF EXAMINATION.—(f) Every State inspector in the regular inspection of mines shall measure with an anemometer and determine the amount of air passing in the last cross-cut in each pair of entries in pillar and room mines, or in the last room of each division in long-wall mines. He shall also measure with an anemometer and determine the amount of air passing at the inlet and outlet of the mines; and he shall compare all such air measurements with the last report of the mine examiner and the mine manager upon the mine examination book of the mine. He must observe that the legal code of signals between the engineer and top man and bottom man is established and conspicuously posted for the information of all employees.

State inspectors also shall require that every necessary precaution be taken to insure the health and safety of the workmen employed in the mines, and that the provisions and requirements of all the mining laws of this State are obeyed.

State inspectors shall render written reports of mine inspections made by them to the State Mining Board in such form and manner as shall be required by the board. State inspectors shall take prompt action for the enforcement of the penalties provided for violation of the mining laws.

AUTHORITY TO ENTER.—(g) It shall be lawful for State inspectors to enter, examine and inspect any and all coal mines and the machinery belonging thereto, at all reasonable times, by day or by night, but so as not to unreasonably obstruct or hinder the working of such coal mine, and the operator of every such coal mine is hereby required to furnish all necessary facilities for making such examination and inspection.

PROCEDURE IN CASE OF OBJECTION.—(h) If any operator shall refuse to permit such inspection or to furnish the necessary facilities for making such examina-

tion and inspection, the inspector shall file his affidavit, setting forth such refusal, with the judge of the circuit court in said county in which said mine is situated, either in term time or vacation, or, in the absence of said judge, with a master in chancery in said county in which said mine is situated, and obtain an order on such owner, agent or operator so refusing as aforesaid, commanding him to permit and furnish such necessary facilities for the inspection of such coal mine, or to be adjudged to stand in contempt of court and punished accordingly.

NOTICES TO BE POSTED.—(1) The State inspector shall post in some conspicuous place at the top of each mine inspected by him, a plain statement showing what in his judgment is necessary for the better protection of the lives and health of persons employed in such mine, such statement shall give the date of inspection and be signed by the inspector. He shall post a notice at the landing used by the men, stating what number of men will be permitted to ride on the cage at any one time, and the rate of speed at which men may be hoisted and lowered on the cages. (Paragraphs (j) and (k) are on page 49.)

INSPECTORS' ANNUAL REPORTS.—(1) Each State inspector of mines shall, within sixty days after June 30 of each year, prepare and forward to the State Mining Board a formal report of his acts during the year in the discharge of his duties, with any recommendations as to legislation he may deem necessary on the subject of mining, and shall collect and tabulate upon blanks furnished by said board all desired statistics of mines and miners within his district to accompany said annual report.

REPORTS TO BE PUBLISHED.—(m) On the receipt of said inspectors' reports the chief clerk of the State Mining Board shall compile and summarize the same, to be included in the report of said board, to be known as the Annual Coal report, which shall, within four months thereafter, be bound, printed and transmitted to the Governor for the information of the General Assembly and the public. The printing and binding of said reports shall be provided for by the Commissioners of State Contracts in like manner and in like numbers as they provide for the publication of other official reports to the Governor.

REPORTS BY OPERATOR.—(n) Every coal operator shall within thirty days after June 30 of each year, furnish to the State mine inspector of the district, on blanks furnished by him prior to said June 30, statistics of the wages and conditions of their employees as required by law. The failure of any inspector to forward to the State Mining Board his formal report, as provided in paragraph [one] (1) hereof, or the failure of any coal operator to furnish to the State Mine Inspector of the district the statistics provided for herein, shall be adjudged a misdemeanor and be subject to a fine of \$100.

SEC. 6. PAY OF INSPECTORS.—Each State Inspector of mines shall receive a compensation for his services the sum of \$1,800 per annum, and for traveling and other necessary expenses each shall receive the sum actually expended for that purpose in the discharge of his official duties: Provided, such expenses shall not exceed one hundred dollars (\$100) per calendar month for each State Inspector of mines, both salary and expenses to be paid monthly by the State Treasurer, on warrants of the Auditor of Public Accounts, from the funds in the treasury not otherwise appropriated; said expense vouchers shall show the items of expenditures in detail, with sub-vouchers for the same so far as it is practicable to obtain them. Said vouchers shall be sworn to by the inspector and be approved by the president of the State Mining Board and the Governor.

NOTE.—The remaining amendatory sections, 10, 11, 14, 16, 18, 19, 20, and 21, are under the appropriate title, Mining Operations. See page 229.

SECOND AMENDATORY ACT.

LAWS 1915, P. 506.

JUNE 23, 1915.

AN ACT to amend sections 2, 3, 5, 6, 7, 9, 10, 15, 21, and 25 of An Act entitled, "An Act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.:

That sections 2, 3, 5, 6, 7, 9, 10, 15, 21, and 25 of An Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, approved June 26, 1913, in force July 1, 1913, be and the same are hereby amended so as to read as follows:

SEC. 2. CREDENTIALS.—(a) An applicant for any certificate herein provided for, before being examined, shall register his name with the State mining board and file with the board the credentials required by this Act, to wit: An affidavit as to all matters of fact establishing his right to receive the examination and a certificate of good character and temperate habits signed by at least ten residents of the community in which he resides.

EXAMINATION FOR INSPECTORS.—(b) Each applicant for a certificate of competency as State inspector of mines shall produce evidence satisfactory to the board that he is a citizen of this State, at least thirty years of age, that he has had a practical mining experience of ten years, of which at least two years have been in the State of Illinois, and that he is a man of good repute and temperate habits; he shall pass an examination as to his practical and technological knowledge of mine surveying and mining machinery and appliances, of the proper development and operation of coal mines, of ventilation in mines, of the nature and properties of mine gases, of first aid to injured, of mine rescue methods and appliances, of the geology of coal measures in this State, and of the laws of this State relating to coal mines.

NAMES CERTIFIED TO THE GOVERNOR.—(c) At the close of each examination for inspectors the board shall certify to the Governor the names of all candidates who have received a rating above the minimum fixed by the rules of the board as being persons properly qualified for the position of inspector.

EXAMINATION FOR MINE MANAGERS.—(d) Each applicant for a certificate of competency as mine manager shall produce evidence satisfactory to the board that he is a citizen of the United States, at least twenty-four years of age, that he has had at least four years' practical mining experience, and that he is a man of good repute and temperate habits; he shall also pass such examination as to his experience in mines and in the management of men, his knowledge of mine machinery and appliances, the use of surveying and other instruments used in mining, the properties of mine gases, the principles of ventilation, of first aid to injured, of mine rescue methods and appliances, and the legal duties and responsibilities of mine managers, as shall be prescribed by the rules of the board.

FOR MINE MANAGERS, SECOND CLASS.—(d) Each applicant for certificate of competency as mine managers, second class, shall produce evidence satisfactory to the board that he is a citizen of the United States, at least twenty-four years of age, that he has had at least four years' practical mining experience, and that he is a man of good repute and temperate habits; he shall also submit to and satisfactorily pass such an examination as to his experience in mines and in the management of men, his knowledge of coal mining, mine ventilation and the mining laws of this State and the required duties and responsibilities of second class mine managers, as shall be prescribed by the rules of the board, and it shall be unlawful to employ second-class mine managers, or for them to serve in that capacity at mines employing more than ten men.

EXAMINATION FOR MINE EXAMINERS.—(e) Each applicant for a certificate of competency as mine examiner, shall produce evidence satisfactory to the board that he is a citizen of the United States, at least twenty-one years of age, and of good repute and temperate habits, and that he has had at least four years' practical mining experience. He shall pass an examination as to his experience in mines generating dangerous gases, his practical and technological knowledge of the nature and properties of fired-damp, (fire-damp), the laws of ventilation, the structure and uses of safety lamps, and the laws of this State relating to safeguards against fires from any source in mines. He shall also possess a knowledge of first aid to the injured and of mine rescue methods.

EXAMINATION FOR HOISTING ENGINEERS.—(f) Each applicant for a certificate of competency as hoisting engineer shall produce evidence satisfactory to the board that he is a citizen of the United States, at least twenty-one years of age, that he has had at least two years' experience as fireman or engineer of a hoisting plant, and is of good repute and temperate habits. He shall pass an examination as to his experience in handling hoisting machinery, and as to his practical and technological knowledge of the construction, cleaning and care of steam boilers, the care and adjustment of hoisting engines, the management and deficiency of pumps, ropes and window (windlass) apparatus, and as to his knowledge of the laws of this State in relation to signals and the hoisting and lowering of men at mines.

The State Mining Board shall have power to grant a permit to operate a second motion engine at any mine employing not more than ten men to any person recommended to the board by the State mine inspector of the district: Provided, that the applicant for such permit shall have filed with the State mining board satisfactory evidence that he is a citizen of the United States, that he has had at least one year's experience in operating a steam engine and steam boiler and understands the handling and care of the same. Such application shall be accompanied by a statement from at least three persons who will testify from their personal knowledge of the applicant that he is a man of good repute and personal habits, and that he has, in their judgment, a knowledge of and experience in handling boilers and engines, as required in this section. Such permit shall apply only to the mine for which it was issued.

EXAMINATION PAPERS PRESERVED.—(g) There shall be (a) written and an oral examination of applicants as may be prescribed by the rules of the board; and all written examination papers and all other papers of applicants shall be kept on file by the board for not less than one year, during which time any applicant shall have the right to inspect his said papers at all reasonable times; and any applicant shall be entitled to a certified copy of any or all of his said papers upon payment of a reasonable copy fee therefor.

SEC. 3. CERTIFICATES ISSUED BY THE BOARD.—(a) The certificates provided for in this Act shall be issued under the signature and seal of the State Mining Board, to all those who receive a rating above the minimum fixed by the rules of the board; such certificates shall contain the full name, age and place of birth of the recipient and the length and nature of his previous service in or about coal mines.

RECORD TO BE PRESERVED.—(b) The board shall make and preserve a record of the names and addresses of all persons to whom certificates are issued.

EFFECT OF CERTIFICATES.—(c) The certificates provided for in this Act shall entitle the holders thereof to accept and discharge at any mine in this State, the duties for which they are declared qualified.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE MANAGERS.—(d) It shall be unlawful for the operator of any coal mine to have in his service as mine manager at his mine, any person who does not hold a certificate of competency

issued by the State Mining Board of this State: Provided, that whenever any exigency arises by which it is impossible for any operator to secure the immediate services of a certified mine manager, he may place any trustworthy and experienced man of the mine inspection district in charge of his mine to act as temporary mine manager for a period not exceeding seven days, and with the approval of the State inspector of the district, for a further period not exceeding twenty-three days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED MINE EXAMINERS.—(e) It shall be unlawful for the operator of any mine to have in his service as mine examiner any person who does not hold a certificate of competency issued by the State Mining Board: Provided, that any one holding a mine manager's certificate may serve as mine examiner; but in any mine employing more than twenty-five (25) men, the mine manager shall not act in the capacity of mine examiner while acting as mine manager; And, provided, whenever an exigency arises by which it is impossible for any operator to secure the immediate services of a certificated examiner, he may employ any trustworthy and experienced man of the mine-inspection district to act as temporary mine examiner for a period not exceeding seven days, and with the approval of the State inspector of the district, for a further period not exceeding twenty-three days.

UNLAWFUL TO EMPLOY OTHER THAN CERTIFICATED HOISTING ENGINEERS.—(f) It shall be unlawful for the operator of any mine to permit any person who does not hold a certificate of competency as hoisting engineer issued by the State Mining Board, to hoist or lower men, or to have charge of the hoisting engine when men are underground, except as provided in section 2, paragraph (f).

TEMPORARY EMPLOYMENT OF UNCERTIFICATED PERSONS NOT EXTENDED.—(g) The employment of persons who do not hold certificate as mine managers and mine examiners shall in no case exceed the limit of time specified herein, and the State inspector shall not approve of the employment of such persons beyond the twenty-three day limit.

REMOVAL OF INSPECTORS.—(h) Upon a petition signed by not less than three coal operators, or ten coal miners, setting forth that any State inspector of mines neglects his duties, or that he is incompetent, or that he is guilty of malfeasance in office, or guilty of any act tending to the unlawful injury of miners or operators of mines, it shall be the duty of the State Mining Board to issue a citation to the said inspector to appear before it within a period of fifteen days on a day fixed for said hearing, when the said board shall investigate the allegations of the petitioners; and if the said board shall find that the said inspector is neglectful of his duty or is incompetent or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, the said board shall declare the office of said inspector vacant, and a properly qualified person shall be duly appointed, in the manner provided for in this Act, to fill said vacancy.

CANCELLATION OF CERTIFICATES.—(i) The certificate of any mine manager, hoisting engineer or mine examiner may be cancelled and revoked by the State Mining Board upon notice and hearing as hereinafter provided, if it shall be established in the judgment of said board that the holder thereof has become unworthy to hold said certificate by reason of violation of the law, intemperate habits, incapacity, abuse of authority or for any other cause: Provided, that any person against whom charges or complaints are made hereunder shall have the right to appear before said board and defend against said charges, and he shall have fifteen days' notice in writing of such charges previous to such hearing: Provided, further, that the board, in its discretion, may suspend the certificate of any person charged as aforesaid, pending such hearing, but said hearing shall not be unreasonably deferred.

SEC. 5. INSPECTORS APPOINTED.—(a) From the names certified by the State Mining Board, the Governor shall select and appoint twelve State mine inspectors; that is to say, one inspector for each of the twelve inspection districts provided for in this Act; or more, if, in the future, additional inspection districts shall be created, and their commissions shall be for a term of two years from July 1, provided the term of any State mine inspector in office July 1, 1911, shall be extended to October 1, 1911, and provided any State inspector in actual service and good standing and who has passed one examination under this Act may be reappointed for the next ensuing term, without further certification, but shall not be so reappointed more than three times: Provided, further, no man shall be eligible for appointment as a State inspector of mines who has any pecuniary interest in any coal mine in Illinois.

(b) The board of supervisors in counties under township organization or commissioners in counties not under township organization, of any county in which coal is produced, upon the written request of the State inspector of mines for the district in which said county is located, shall appoint, as assistant to such State inspector, a county inspector of mines who shall work under the direction of such State inspector, but no person shall be eligible for appointment as county inspector who does not hold a State certificate of competency as mine manager, and the compensation of such county inspector shall be fixed by the county board at not less than five dollars per day, to be paid out of the county treasury.

If any county board shall fail or refuse to appoint a suitable person as county mine inspector, or to make an adequate appropriation for such county mine inspector when appointed within ninety days after the filing of a written request by the State inspector of mines in and for the district in which such county is located, then the State mine inspector or chief clerk of the State Mining Board, may file a petition verified by oath in the county court of such county, setting forth the condition of coal mining in said county which requires the appointment of such county mine inspector, the request in writing as aforesaid by the State inspector, and the failure and refusal by the county board to make such appointment or such appropriation as the case may be; and the prayer of such petition shall be that the judge of such county court appoint a county mine inspector or order the county board to make such appropriation; and thereupon such county court shall cause summons to issue, commanding the sheriff of the county that he summon the county board to be and appear at a term of court therein named, returnable as summons in other suits at law, and to show cause, if any there be, why such county mine inspector should not be appointed as prayed in such petition; which summons may be served as other summons in which a corporation is defendant; which petition and any answer thereto may be set down for hearing before such county court at an early date; and if upon such hearing it shall appear to the court that sufficient cause has not been shown why such county mine inspector should not be appointed, such court may make a finding accordingly, and the judge thereof may make such appointment; and the order making such appointment shall be entered of record in the cause and the person so appointed shall act as such county mine inspector until the further order of court or until such time, not less than one year thereafter, as such county board shall have appointed a successor to the person appointed by the judge of such court, and such successor shall have qualified to act; and the judge of such court may in his discretion remove the inspector by him appointed and appoint a successor, and may order the county board from time to time to make an adequate appropriation for such county mine inspector and shall have power to punish as for contempt of court any disobedience to any such order.

An appeal shall lie from any final order of the county court in such proceeding to the appellate court of the State, but the operation of such order shall not thereby be stayed unless by an order made and entered by such appellate court or some judge thereof.

The State Inspector may authorize any county inspector in his district to assume and discharge all the duties and exercise all the powers of a State inspector in the county for which he is appointed, in the absence of a State inspector; but such authority must be conferred in writing and the county inspector must produce the same as evidence of his powers upon the demand of any person affected by his acts; and the bond of said State inspector shall be holden for the faithful performance of the duties of such assistant inspector.

BOND.—(c) State inspectors, before entering upon their duties as such, must take an oath of office, as provided for by the Constitution, and enter into a bond to the State in the sum of five thousand dollars (\$5,000) for State mine inspectors, with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular, as required by this Act. Said bonds, with the approval of the Governor endorsed thereon, together with the oath of office, shall be deposited with the Secretary of State.

INSTRUMENTS.—(d) The State Mining Board shall furnish to each of said State inspectors an anemometer, a safety-lamp, and such other instruments and such blanks, blank-books, stationery, printing and supplies as may be required by said inspectors in the discharge of their official duties. Said instruments and supplies shall be paid for on bills of particulars certified by the proper officers of the board and approved by the Governor; and the Auditor of Public Accounts shall draw his warrants on the State treasury for the amounts thus shown to be due, payable out of any money in the treasury not otherwise appropriated.

EXAMINATION OF MINES. (e) State inspectors shall devote their whole time and attention to the duties of their respective offices. State inspectors shall make a personal examination at least once in every six months or oftener if necessary, of each mine in their district in which ten or more men are employed. The State Mining Board also may require State inspectors personally to examine any or all other mines in their respective districts. Every mine in the State shall be examined at least once in every six months by either a State or county mine inspector.

SCOPE OF EXAMINATION.—(f) Every State inspector in the regular inspection of mines shall measure with an anemometer and determine the amount of air passing in the last crosscut in each pair of entries in pillar and room mines, or in the last room of each division in long-wall mines. He shall also measure with an anemometer and determine the amount of air passing at the inlet and outlet of the mines; and he shall compare all such air measurements with the last report of the mine examiner and the mine manager upon the mine examination book of the mine. He must observe that the legal code of signals between the engineer and top man and bottom man is established and conspicuously posted for the information of all employees.

State inspectors also shall require that every necessary precaution be taken to insure the health and safety of the workmen employed in the mines, and that the provisions and requirements of all the mining laws of this State are obeyed.

State inspectors shall render written reports of mine inspections made by them to the State Mining Board in such form and manner as shall be required by the board. State inspector(s) shall take prompt action for the enforcement of the penalties provided for violation of the mining laws.

AUTHORITY TO ENTER.—(g) It shall be lawful for State inspectors to enter, examine and inspect any and all coal mines and the machinery belonging thereto, at all reasonable times, by day or by night, but so as not to unreasonably obstruct or hinder the working of such coal mine, and the operator of every such coal mine is hereby required to furnish all necessary facilities for making such examination and inspection.

PROCEDURE IN CASE OF OBJECTION.—(h) If any operator shall refuse to permit such inspection or to furnish the necessary facilities for making such examination and inspection, the inspector shall file his affidavit, setting forth such refusal, with the judge of the circuit court in said county in which said mine is situated, either in term time or vacation, or, in the absence of said judge, with a master in chancery in said county in which said mine is situated, and obtain an order on such owner, agent or operator so refusing as aforesaid, commanding him to permit and furnish such necessary facilities for the inspection of such coal mine, or be adjudged to stand in contempt of court and punished accordingly.

NOTICES TO BE POSTED.—(i) The State inspector shall post in some conspicuous place at the top of each mine inspected by him, a plain statement showing what in his judgment is necessary for the better protection of the lives and health of persons employed in such mine, such statement shall give the date of inspection and be signed by the inspector. He shall post a notice at the landing used by the men, stating what number of men will be permitted to ride on the cage at one time and the rate of speed at which men may be hoisted and lowered on the cages.

NOTE.—Paragraphs (j) and (k) are on page 50.

INSPECTORS' ANNUAL REPORTS.—(l) Each State inspector of mines shall, within sixty days after June 30, of each year, prepare and forward to the State Mining Board a formal report of his acts during the year in the discharge of his duties, with any recommendations as to legislation he may deem necessary on the subject of mining, and shall collect and tabulate upon blanks furnished by said board all desired statistics of mines and miners within his district to accompany said annual report.

REPORTS TO BE PUBLISHED.—(m) On the receipt of said inspectors' reports the chief clerk of the State Mining Board shall compile and summarize the same, to be included in the report of said board, to be known as the Annual Coal Report, which shall, within four months thereafter, be bound, printed and transmitted to the Governor for the information of the General Assembly and the public. The printing and binding of said reports shall be provided for by the commissioners of State contracts in like manner and in like numbers as they provide for the publication of other official reports to the Governor.

REPORTS BY OPERATOR.—(n) Every coal operator shall within thirty days after June 30, of each year, furnish to the State mine inspector of the district, on blanks furnished by him prior to said June 30, statistics of the wages and conditions of their employees as required by law. The failure of any inspector to forward to the State Mining Board his formal report, as provided in paragraph (one) (1) hereof, or the failure of any coal operator to furnish to the State mine inspector of the district the statistics provided for herein, shall be adjudged a misdemeanor and be subject to a fine of \$100.

SEC. 6. PAY OF INSPECTORS.—Each State inspector of mines shall receive as compensation for his services the sum of eighteen hundred dollars (\$1,800) per annum and for traveling and other necessary expenses each shall receive the sum actually expended for that purpose in the discharge of his official duties: Provided, such expenses shall not exceed \$1,200 per annum for each State

Inspector of mines, both salary and expenses to be paid monthly by the State Treasurer, on warrants of the Auditor of Public Accounts, from the funds in the treasury not otherwise appropriated; said expense vouchers shall show the items of expenditures in detail, with sub-vouchers for the same so far as it is practicable to obtain them. Said vouchers shall be sworn to by the Inspector and be approved by the president of the State Mining Board and the Governor.

NOTE.—The remaining amendatory sections, 7, 9, 10, 15, 21, and 25, are under the appropriate title, Mining Operations. See page 238.

APPROPRIATIONS.

LAWS 1905, 62, P. 69.

MAY 18, 1905.

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

* * * * *
Thirty-seventh. * * *

State Mining Board for expenses including stenographer at \$720, the sum of \$6,000 per annum.

* * * * *
LAWS 1907-8, 17, P. 25 (ADJOURNED SESSION).

JUNE 4, 1907.

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

* * * * *
Forty-fourth. State Mining Board, for examination of candidates for certificates, etc., including salary of stenographer at \$720, \$6,000 per annum.

* * * * *
LAWS 1909, 77, P. 85.

JUNE 16, 1909.

AN ACT to provide for the ordinary and contingent expenses of the State government, etc.

SECTION 1. Be it enacted, etc.: That the following named sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State government, etc.:

* * * * *
Forty-fourth. To the State Mining Board for expenses, etc. \$6,000 including salary of stenographer at \$720.

* * * * *
LAWS 1911, 90, P. 101.

JUNE 10, 1911.

AN ACT to provide for the ordinary and contingent expenses of the State government until the expiration of the first fiscal quarter after the adjournment of the next regular session of the General Assembly.

SEC. 1. Be it enacted, etc.: * * *

Forty-fourth. To the State Mining Board for the examination of the candidates for certificates as mine inspectors, mine managers, mine examiners and hoisting engineers, for per diem and expenses of the board in conducting such examinations, for clerk hire, oils, powder and incidental expenses, the sum of \$13,000 per annum.

LAWS 1911-12, 20, P. 31.

JUNE 6, 1912.

AN ACT to amend section 1 of an act entitled, "An Act, etc., (same as in section 1).

SECTION 1. Be it enacted, etc.: That section one of an Act entitled, "An Act to provide for the ordinary and contingent expenses of the State government until the expiration of the first fiscal quarter after the adjournment of the next

regular session of the General Assembly," approved June 10, 1911, in force July 1, 1911, be and the same is hereby amended to read as follows:

SEC. 1. That the following named sums, or so much thereof as may be necessary, respectively, for the purposes hereinafter named be and are hereby appropriated to meet the ordinary and contingent expenses of the State Government.

* * * * *

44. To the State Mining Board, for the examination of candidates for certificates as mine inspectors, mine managers, mine examiners and hoisting engineers, for per diem and expenses of the board in conducting such examinations, for clerk hire, oils, powder and incidental expenses, the sum of \$13,000 per annum or as much thereof as may be necessary.

45. To the State Mine Inspectors for actual expenses incurred in the discharge of their duties as provided by law the sum of \$12,000 per annum, or as much thereof as may be necessary of which sum not to exceed \$1,000 per annum shall be paid to any one inspector.

* * * * *

LAW 1913, 95, P. 107.

JUNE 30, 1913.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SECTION 1. Be it enacted, etc.: That the following named sums, or so much thereof as may be necessary, * * * be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc.

* * * * *

Forty-fourth. To the State Mining Board: For expenses-per diem and traveling expenses, five members of the State Mining Board, \$5,000 per annum; for one stenographer and bookkeeper, \$1,200 per annum; one statistician, \$1,800 per annum; one clerk, \$1,500 per annum; for oil and powder testing, \$1,000 per annum; for postage and express, \$1,500 per annum; for telegrams and telephones, \$300 per annum; for incidental expenses, \$400 per annum.

LAW 1915, 283, P. 215.

JUNE 29, 1915.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SECTION 1. Be it enacted, etc.: That the following named sums be, and are hereby appropriated to meet the ordinary and contingent expenses of the State Government, etc.:

* * * * *

Thirty-ninth. To the State Mining Board: For president of the board, extra for preparing examination questions, \$150 per annum; for statistician, \$1,800 per annum; for department clerk, \$1,500 per annum; for stenographer, \$1,200 per annum; for assistant statistician and messenger, \$900 per annum; for postage, \$900 per annum; for printing, etc. \$200 per annum; for carpets and filing cabinet, \$300; for anemometers and safety lamps, \$250 per annum; for telephone, telegraph and express, \$525 per annum; for traveling expenses of 5 members and chief clerk, \$3,630 per annum; for repairs on instruments, \$50 per annum; for oil and powder testing, \$500 per annum; for rent of rooms for holding examinations, \$125 per annum.

MINERS' EXAMINING BOARD—EXAMINATION OF MINERS.

EVIDENCE OF COMPETENCY.

LAWS 1897, P. 268. (FOR ANNOTATIONS, SEE PAGE 245.) JUNE 7, 1897.

AN ACT in relation to the safety and the competency of coal miners, and to punish for infraction of the same.

SECTION 1. Be it enacted, etc.: That from and after the passage of this Act every person desiring to work by himself in rooms of coal mines in this State shall first produce satisfactory evidence to the mine manager of the mine in which he is employed, or desires to be employed, that he has worked at least two (2) years with or as a practical miner. Until said applicant has so satisfied the mine manager of the mine in which he seeks such employment of his competency, he shall not be allowed to mine coal unless accompanied by some competent coal miner, until he becomes duly qualified.

SEC. 2. Any violation of section one (1) of this Act shall work a forfeiture of the certificate of the manager of the mine where any such party or parties are employed.

NOTE.—Repealed by act of June 1, 1908 (Laws 1907-8, p. 90). See the following Act.

EXAMINATION AND CERTIFICATES.

LAWS 1907-8, P. 90 (ADJOURNED SESSION).

JUNE 1, 1908.

AN ACT to provide for the safety of persons employed in and about coal mines and to provide for the examination of persons seeking employment as coal miners, and to prevent the employment of incompetent persons as miners, and providing penalties for the violation of the same. (See page 439.)

SECTION 1. Be it enacted, etc.: That hereafter no person whosoever shall be employed or engaged as a miner in any coal mine in this State without having obtained a certificate of competency and qualification so to do from a "Miner's Examining Board" of some county of this State, except that any miner employed in the State when this Act becomes effective, who has been employed at least two years in the coal mines, shall be entitled to a certificate permitting him to work in the mines of this State as a practical miner: Provided, that the above provisions shall not prevent the employment of persons not having such certificate who are employed or engaged to work with or under the direction of a miner having such certificate, for the purpose of becoming qualified to receive such certificate under the provisions of this Act.

SEC. 2. In each county of the State where the business of coal mining is carried on, there shall be created a board to be styled the "Miners' Examining Board," to consist of three miners who shall be appointed by the circuit judges of the judicial district in which such county shall lie; such appointment to be made immediately after this Act shall go into effect, and annually thereafter at the first term of court in each year, all vacancies to be filled by such judges as they occur; and the members of such boards shall be experienced and skillful miners actually engaged in said business in their respective districts.

Each of said boards shall organize by electing one of the members president, and one member secretary; and every member of said board shall, within ten days after his appointment, take and subscribe an oath or affirmation before a properly qualified officer of the county in which he resides, that he will honestly and impartially discharge his official duties.

Members of said board shall receive as compensation for their services three 50-100 dollars (\$3.50) per day for each day actually engaged in their official duties, and all legitimate and necessary expenses incurred in attending the meetings of said board under the provisions of this Act, and no part of the salary of the said boards, or the expenses thereof shall be paid out of the State treasury.

SEC. 3. Each of said examining boards shall designate some convenient meeting place in their respective counties, of which due notice shall be given by advertisement in two or more newspapers of the proper county. At such meeting a book of registration shall be open in which shall be registered the name and address of each and every person to whom they have issued certificates of competency under this Act.

SEC. 4. Each applicant for examination for the certificate herein provided, shall pay a fee of one dollar, and the amount derived from this source shall be held by said boards and applied to the expense and salaries herein provided and such as may arise under the provisions of this Act. The said boards shall report in writing annually to the court appointing them and to the State inspectors of mines, all moneys received and disbursed under the provisions of this Act, together with the number of miners examined under this Act and the number failing to pass the required examination.

SEC. 5. It shall be the duty of said boards to meet on the first Wednesday of each month, but when said day falls on a legal holiday then the day following, and said meeting shall be public, and if necessary the meeting shall be continued to cover whatever portion may be required of a period of three days in succession, or for the first session of the respective boards hereunder such longer period as may be required to examine all applicants for examination presenting themselves, and examine under oath all persons who desire to be employed as miners in the respective counties; and said board shall grant such persons as may be qualified, certificates of competency or qualification which shall entitle the holders thereof to be employed as and to do the work of miners as may be expressed in said certificate and such certificates shall be good and sufficient evidence without an examination in any other county of the state of competency under this Act.

Every person applying for a certificate of competency, or to entitle him to be employed as a miner must produce evidence of having had not less than two years of practical experience as a miner or with a miner, and in no case shall an applicant be deemed competent unless he appear in person before the said board and orally answer intelligently and correctly at least twelve practical questions propounded to him by said board pertaining to the requirements of a practical miner. The said board shall keep an accurate record of the proceedings of their meetings and in said record shall show a correct detailed account of the examination of each applicant with questions asked and their answers and at each of these meetings the board shall keep said record open for public inspection. Any miners' certificate granted under the provisions of this Act shall not be transferable, and any transfers of the same shall be deemed a violation of this Act. Such certificates shall be issued only at meetings of said boards, and said certificates shall not be legal unless then and there signed by at least two members of such board.

SEC. 6. That no person shall hereafter engage as a miner in any coal mine without having obtained such certificate as aforesaid. And no person shall employ any person as a miner who does not hold such certificate as aforesaid, and no mine foreman or superintendent shall permit or suffer any person to be employed under him, or in the mines under his charge and supervision as a miner, who does not hold such certificate. Any person or persons who shall

violate or fail to comply with the provisions of this Act shall be guilty of a misdemeanor, and on conviction thereof shall be sentenced to pay a fine of not less than one hundred dollars and not to exceed five hundred dollars, or shall undergo imprisonment in the county jail for a term of not less than thirty days and not to exceed six months, or either, or both, at the discretion of the court.

SEC. 7. It shall be the duty of the several miners' examining boards to investigate all complaints or charges of non-compliance or violation of the provisions of this Act, and to prosecute all persons so offending; and it shall be the duty of the prosecuting attorney of the judicial district wherein the complaints or charges are made to investigate the same and prosecute all persons so offending, and it shall at all times be the duty of such prosecuting attorney to prosecute such members of the Miners' Examining Board as have failed to perform their duty under the provisions of this Act. Upon conviction of any member of the Miners' Examining Board for any violation of this Act, in addition to the penalties herein provided, his office shall be declared vacant, and he shall be deemed ineligible to act as a member of the said board.

SEC. 8. For the purpose of this Act the members of the said Miners' Examining Board shall have the power to administer oaths.

SEC. 9. An Act entitled "An Act in relation to the safety and competency of coal miners, and to punish for infraction of the same," approved June 7, 1897, in force July 1, 1897, is hereby repealed.

FIRST AMENDATORY ACT, 1909.

LAWS 1909, P. 244.

JUNE 5, 1909.

MINERS' EXAMINING BOARD.

AN ACT to amend an act entitled An Act (same as section 1).

SECTION 1. Be it enacted, etc.: That an Act entitled "An Act to provide for the safety of persons employed in and about coal mines, and to provide for the examination of persons seeking employment as coal miners, and to prevent the employment of incompetent persons as miners, and providing penalties for the violation of the same," approved June 1, 1908, and in force July 1, 1908, be and the same is hereby amended to read as follows:

SEC. 1. That hereafter no person whoever shall be employed or engaged as a miner in any coal mine in this State without having first obtained a certificate of competency and qualification so to do from a "Miners' Examining Board" of some county in this State: Provided, that any miner actually employed in this State when this Act becomes effective, who has been employed as a miner at least two years in coal mines, shall be entitled to a certificate permitting him to work in the mines of this State as a practical miner: And, provided, further, that any such certificated miner may have one uncertificated person working with him and under his direction for the purpose of learning said business of mining and becoming qualified to obtain a certificate in conformity with the provisions of this Act.

SEC. 2. In each county of this State where the business of coal mining is carried on, there shall be created a board to be styled "The Miners' Examining Board," to consist of three practical, experienced and skilful miners of at least five years' continuous experience, who are then actually engaged in mining coal in the county for which they are appointed. Such appointments shall be made by the county judges in their respective counties immediately after this Act shall be in effect, and on or before the 10th day of January in

each year thereafter, and all vacancies in said board shall be at once filled by the county judge of the county in which such vacancy occurs.

Each of said boards shall organize by electing one of the members president, and one member secretary; and every member of said board shall, within ten days after his appointment, take and subscribe an oath or affirmation before a properly qualified officer of the county in which he resides, that he will honestly and impartially discharge his official duties; each of said boards shall provide itself with an impression seal, having engraved thereon the name of said board and the county for which it is appointed.

Members of said board shall receive as compensation for their services three and fifty one-hundredths dollars (\$3.50) per day for each day actually engaged in their official duties, and all legitimate and necessary expenses incurred in attending the meetings of said board under the provisions of this Act, and no part of the salary of the members of said board, or the expenses thereof shall be paid out of the State treasury except as herein provided.

SEC. 3. Each of said examining boards shall designate some convenient meeting place in their respective counties, of which due notice shall be given by advertisement in two or more newspapers of the proper county. At such meeting a book of registration shall be open in which shall be registered the name and address of each and every person to whom said board shall issue a certificate of competency under this Act.

SEC. 4. Each applicant for examination for the certificate herein provided, shall pay a fee of one dollar, and the amount derived from this source shall be held by said boards respectively and applied to the expense and salaries herein provided and such as may arise under the provisions of this Act. The said boards shall report in writing quarterly to the court appointing them, all moneys received and disbursed under the provisions of this Act, together with the number of miners examined under this Act and the number failing to pass the required examination.

All moneys over and above the amount required to pay the salaries of the members of said board in the respective counties, and their necessary actual expenses while in the performance of their duty as such board shall be paid to the State Treasurer on the second Wednesday of each and every month, and the same shall be paid out by said State Treasurer only upon warrants issued by the county judge of the county for which such board was appointed.

Said warrants shall show on their face that they are for the payment of the salary and necessary actual expenses of the members of said board in such county.

SEC. 5. It shall be the duty of said boards respectively to meet on the first Wednesday of each month and to remain in session for a period of two days and no longer, and said meeting shall be public. The said board shall examine under oath all persons residing in the county in which said board resides who apply for certificates as provided in this Act, and said board shall grant such certificates of competency or qualifications to such applicants as are qualified, which certificates shall entitle the holders thereof to be employed as, and to do the work of miners in any county in this State, without other or further examination.

No certificate of competency shall issue or be given to any person under this Act unless he shall produce evidence of having had not less than two years of practical experience as a miner or with a miner, and in no case shall an applicant be deemed competent unless he appear in person before the said board and orally answer intelligently and correctly at least twelve practical questions propounded to him by the board pertaining to the requirements and qualifications of a practical miner.

The said board shall keep an accurate record of the proceedings of their meetings and in said record shall show a correct detailed account of the examination of each applicant with questions asked and their answers and at each of these meetings the board shall keep said record open for public inspection. Any miners certificate granted under the provisions of this Act shall not be transferable, and any transfer of the same shall be deemed a violation of this Act. Such certificates shall be issued only at meetings of said boards, and said certificates shall not be legal unless then and there signed by at least two members of said board, and sealed with the seal of the board issuing the certificates.

SEC. 6. That no person shall hereafter engage as a miner in any coal mine without having obtained such certificate as aforesaid. And no person shall employ any person as a miner who does not hold such certificate as aforesaid, and no mine foreman or superintendent shall permit or suffer any person to be employed under him, or in the mines under his charge and supervision as a miner, except as herein provided, who does not hold such certificate. Any person or persons who shall violate or fail to comply with the provisions of this Act shall be guilty of a misdemeanor, and on conviction thereof shall be sentenced to pay a fine of not less than one hundred dollars and not more than five hundred dollars, or shall undergo imprisonment in the county jail for a term of not less than thirty days and not to exceed six months, or both, at the discretion of the court.

SEC. 7. It shall be the duty of the several miners' examining boards to investigate all complaints or charges of non-compliance or violation of the provisions of this Act, and to prosecute all persons so offending; and it shall be the duty of the prosecuting attorney of the County wherein the complaints or charges are made to investigate the same and prosecute all persons so offending, and it shall at all times be the duty of such prosecuting attorney to prosecute such members of the Miners' Examining Board as have failed to perform their duty under the provisions of this Act. Upon conviction of any member of the Miners' Examining Board for any violation of this Act, in addition to the penalties herein provided, his office shall be declared vacant, and he shall be deemed ineligible to act as a member of the said board.

SEC. 8. For the purpose of this Act the members of the said Miners' Examining Board shall have the power to administer oaths.

SEC. 9. An Act entitled "An Act in relation to the safety and competency of coal miners, and to punish for infraction of same," approved June 7, 1897, in force July 1, 1897, is hereby repealed.

SECOND AMENDATORY ACT, 1913.

LAWS 1913, P. 438.

JUNE 27, 1913.

AN ACT to provide for the safety of persons employed in and about coal mines, and to provide for the examinations of persons seeking employment therein in order that only competent persons may be employed as miners, and to create a board of examiners for this purpose and to provide a penalty for a violation of the same, and to repeal an Act entitled, "An Act to amend an Act entitled, 'An Act to provide for the safety of persons employed in and about coal mines and to provide for the examination of persons seeking employment as coal miners, and providing penalties for the violation of the same, approved June 1, 1908, in force July 1, 1908,' approved June 5, 1909, in force July 1, 1909."

SECTION 1. Be it enacted, etc.: That hereafter no person shall be employed or engaged as a miner in any coal mine in this State without having first obtained a certificate of competency and qualification so to do from the "Miners' Exam-

ining Board" of this State, created by this Act: Provided, however, that any such certificated miner may have one person working with him and under his directions as an apprentice for the purpose of learning the business of mining and becoming qualified to obtain a certificate in conformity with the provisions of this Act.

SEC. 2. The Governor shall, by and with the advice and consent of the Senate, within thirty days after this Act shall take effect, appoint three persons as Miners' Examining Commissioners, who shall constitute the "Miners' Examining Board," for the State of Illinois, and who shall hold office as follows: One of said appointees shall hold office until March 1, 1914, one until March 1, 1915, and one until March 1, 1916, and on the first day of March of each year after this Act shall take effect, one member of said board shall be appointed and the term of office thereafter shall be three years for each member, or until his successor is appointed and qualified. Two of such commissioners shall constitute a quorum. Said commissioners shall hold no other lucrative office or employment under the government of the United States, State of Illinois, or any political division thereof or any municipal corporation therein and each commissioner before entering upon the duties of his office shall subscribe and take the oath prescribed by the Constitution of this State, and shall before entering upon the duties of his office give a bond with sufficient surety to be approved by the Governor, payable to the People of the State of Illinois, in the penal sum of five thousand dollars (\$5,000), conditioned for the faithful discharge of his duties of office and delivery of records, books, moneys, and other property pertaining to his office to his successor in office, which said bond shall be deposited in the office of the Auditor of Public Accounts.

SEC. 3. No person shall be appointed such miners' examining commissioner who has not had at least five years practical and continuous experience as a coal miner and who has not been actually engaged in coal mining as a miner in the State of Illinois continuously for twelve months next preceding his appointment: Provided, however, that a commissioner may be appointed to succeed himself.

SEC. 4. Each of said commissioners shall receive a salary of fifteen hundred dollars (\$1,500.00) per year, payable monthly, such salary to be paid on the certificate of the president of said board, verified by the commissioner receiving the same, and approved by the Governor.

SEC. 5. Immediately after the appointment or reappointment of a commissioner in each and every year, the said board shall organize by selecting one of its members president and another secretary for the ensuing year, and all records, reports, books, papers and other property pertaining to the office of said board shall be kept by the secretary. The secretary shall be provided with a seal with proper device and on the margin thereof shall be the words "Miners' Examining Board, State of Illinois."

SEC. 6. Such board shall hold an examination once in each calendar month, in at least twelve places located most conveniently with reference to the districts in which coal is mined in the State of Illinois so that all persons in such district or in this State, or who may wish to come into this State, for the purpose of engaging in mining, may be examined as to their competency and qualifications. Notice of the time and place of such examinations shall be published in some newspaper of general circulation printed in the English language and published in the vicinity where such examination will be held. Such notice shall be published at least three times before the date of such examination, the first publication not less than seven days before the examination is to occur. If there is

not such newspaper published at the place of such examination, then such notice shall be published in the newspaper nearest to the place of such examination.

SEC. 7. Each applicant for the certificate provided for herein shall pay a fee of \$2.00 to said board. Fees so collected during each month, shall, before the 10th day of the following month, be paid by the board to the State Treasurer, together with a report showing where and from whom each fee was collected.

SEC. 8. All examinations held by said "Miners' Examining Board" shall be conducted in the English language and shall be of a practical nature so as to determine the competency and qualification of the applicant to engage in the business of mining. Said board shall examine under oath all persons who apply for certificates as to their previous experience as miners and shall grant certificates of competency or qualification to such applicants as are qualified which certificates shall entitle the holder thereof to be employed as and to do the work of miners in this State. No certificate of competency shall issue or be given to any person under this Act unless he shall produce evidence of having had not less than two years' practical experience as a miner or with a miner, and in no case shall an applicant be deemed competent unless he appear in person before said board and orally answer intelligently and correctly at least twelve practical questions propounded to him by the board pertaining to the requirements and qualifications of a practical miner. Said board shall keep an accurate record of its proceedings and meetings and in said record shall show a correct detailed account of the examination of each applicant with questions asked and their answers, and at each of its meetings the board shall keep said record open for public inspection. No miner's certificate granted under the provisions of this Act shall be transferable and any effort to transfer the same shall be deemed a violation of this Act. Such certificates shall be issued only at meetings of said board and said certificates shall not be legal unless signed by at least two members of said board and sealed with the seal of the board issuing such certificates.

SEC. 9. Said board shall annually on the first day of March, report to the Governor, in writing, what examinations it has held and what work it has done during the preceding year, together with such recommendations as it may deem advisable for the improvement of the method of holding examinations and carrying out the purpose of this Act.

SEC. 10. No person shall hereafter engage as a miner in any coal mine without having obtained a certificate of qualification as provided for in this Act, nor shall any person, firm, or corporation employ as a miner in his, their or its mine in this State, any person who does not hold such certificate, nor shall any mine foreman, overseer, or superintendent permit or suffer any person to be employed under him or in any mines under his charge or supervision as a miner in any mine in this State, except as herein provided, who does not hold such certificate of qualification. Any person, firm or corporation who shall violate or fail to comply with the provisions of this Act, shall be deemed guilty of misdemeanor and on conviction thereof shall be fined in any sum not less than one hundred dollars (\$100.00), and not more than five hundred dollars (\$500.00), or shall be imprisoned in the county jail for a term of not less than thirty days, nor to exceed six months, at the discretion of the court.

SEC. 11. It shall be the duty of said "Miners' Examining Board" to report all complaints or charges of noncompliance with, or violation of the provisions of this Act to the State's Attorney of the county in which such non-compliance or violation occurs, and it shall be the duty of the State's Attorney of the county wherein the complaints or charges are made, to investigate the same and prosecute all persons so offending.

SEC. 12. In order to more effectively carry out the intention and purposes of this Act, the "Miners' Examining Board" shall have power to administer oaths to any and all persons who are applicants or may vouch in any manner for the service or qualification of any applicant in order to obtain for him a certificate hereunder, and any person who shall wilfully swear or falsely testify as to any matter material to such examination or as to the service or qualification of any applicant, shall be deemed guilty of perjury and shall be subject to the penalties thereof as prescribed by the criminal code of this State.

SEC. 13. The Governor shall have the power and authority to remove any of said commissioners for neglect of duty, incompetency, or malfeasance in office, and upon such removal shall appoint a successor.

SEC. 14. The validity of any section or part of this Act, shall in no manner affect the validity of any other part of this Act, exclusive of such invalid part or parts, if any.

SEC. 15. That an Act entitled, "An Act to amend an Act entitled, 'An Act to provide for the safety of persons employed in and about coal mines, and to provide for the examination of persons seeking employment as coal miners, and providing penalties for the violation of the same, approved June 1, 1908, in force July 1, 1908,' approved June 5, 1909, in force July 1, 1909," be and the same is hereby repealed.

THIRD AMENDATORY AND REPEALING ACT, 1915.

LAWS 1915, P. 525.

JUNE 29, 1915.

AN ACT to amend section 1, section 2, section 4 and section 6 of "An act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 1, section 2, section 4 and section 6 of an Act entitled "An Act to provide for the safety of persons employed in and about coal mines, and to provide for the examinations of persons seeking employment therein in order that only competent persons may be employed as miners, and to create a board of examiners for this purpose and to provide a penalty for the violation of the same, and to repeal an Act entitled, "An Act to amend an Act entitled, 'An Act to provide for the safety of persons employed in and about coal mines and to provide for the examination of persons seeking employment as coal miners, and providing penalties for the violation of the same,' approved June 1, 1908, in force July 1, 1908, approved June 5, 1909, in force July 1, 1909," approved June 27, 1913, in force July 1, 1913, be amended so as to read as follows:

SECTION 1. Be it enacted, etc.: That hereafter no person shall be employed or engaged as a miner in any coal mine in this State without having first obtained a certificate of competency and qualification so to do from the "Miners' Examining Board" of this State, created by this Act. Miners who now hold certificates heretofore issued by any board of county mine examiners of this State may be permitted on or before July 1, 1916, to produce before the Miners' Examining Board created by this Act, such county mine examiners' board certificate, or if the same shall have been lost or destroyed, satisfactory evidence of its issuance; thereupon, such miner shall be entitled to receive from the Miners' Examining Board created by this Act, the certificate herein provided for, which substitute certificate shall be issued without cost to said miner. After the first day of July, 1916, no miner's certificate of competency or qualification shall be recognized in this State, except those which have been or may be hereby issued by the Board created by this Act: Provided, however, that any such certified miner may have one person working with him and under his directions as an apprentice for the purpose of learning the business of mining

and becoming qualified to obtain a certificate in conformity with the provisions of this Act.

SEC. 2. The Governor shall, by and with the advice and consent of the Senate, within thirty days after this Act shall take effect, appoint three persons as Miners' Examining Commissioners, who shall constitute the Miners' Examining Board for the State of Illinois, and who shall hold office as follows: One of said appointees shall hold office until March 1, 1916, one until March 1, 1917, and one until March 1, 1918, and on the first day of March of each year after this Act shall take effect, one member of said board shall be appointed and the term of office thereafter shall be three years for each member, or until his successor is appointed and qualified. Two of such commissioners shall constitute a quorum. A complete record of the proceedings and acts of the board shall be kept and preserved. Said commissioners shall hold no other lucrative office or employment under the government of the United States, State of Illinois, or any political division thereof or any municipal corporation therein and each commissioner before entering upon the duties of his office shall subscribe and take the oath prescribed by the Constitution of this State, and shall before entering upon the duties of his office give a bond with sufficient surety to be approved by the Governor, payable to the People of the State of Illinois, in the penal sum of five thousand dollars (\$5,000), conditioned for the faithful discharge of his duties of office and the delivery of all records, books, moneys, and other property pertaining to his successor in office, which said bond shall be deposited in the office of the Auditor of Public Accounts.

The Secretary of State shall assign to the use of the Miners' Examining Board, suitable rooms in the State House.

SEC. 4. Each of said Commissioners shall receive as compensation for his services the sum of fifteen hundred (\$1500) dollars per year, and shall also receive his traveling and other necessary expenses actually expended in the discharge of his official duties; such expenses, however, shall not exceed the sum of twelve hundred dollars (\$1200) per annum for any one commissioner. Salary and expenses of said commissioner shall be paid monthly by the State Treasurer on the warrants of the Auditor of Public Accounts from funds in the hands of the Treasurer not otherwise appropriated; all expense accounts shall be itemized and verified by the commissioners receiving the same and shall be approved by the Governor.

SEC. 6. Such board shall hold an examination once in each calendar month, in at least twelve places located most conveniently with reference to the districts in which coal is mined in the State of Illinois so that all persons in such district or in this State, or who may wish to come into this State, for the purpose of engaging in mining, may be examined as to their competency and qualifications. Public notice of said examinations shall be given through the press or otherwise in the discretion of the board, not less than seven days in advance of such meeting, which notice shall fix the time and place at which any examination under this Act is to be held.

ANNOTATIONS.

1. CONSTITUTIONALITY OF STATUTE.
2. PURPOSE OF STATUTE—POLICE POWER.
3. MEMBERS OF BOARD—RESIDENCE AND QUALIFICATION.
4. CERTIFICATED MINERS—EMPLOYMENT—CAPACITY.
5. VIOLATION OF STATUTE—PENALTY.

1. CONSTITUTIONALITY OF STATUTE.

The act of June 5, 1909, is not unconstitutional on the ground that the members of the Miners' Examining Board are State officers and can only be appointed by the Governor. The members of the Miners' Examining Boards appointed for and performing their duties in the county wherein they are appointed have no jurisdiction to act outside the county in which they are appointed. The fact that the official acts of an officer are so far extra-territorial that they are binding throughout the State does not make the officer who performs such acts necessarily a State officer.

People v. Evans, 247 Ill. 547, p. 555.

The act of June 5, 1909, is not unconstitutional on the ground that county judges of the State cannot be invested with the power to appoint the Miners' Examining Boards.

People v. Evans, 247 Ill. 547, p. 557.

The statute is not unconstitutional on the ground that it discriminates in favor of the class of miners who were employed as miners when the act became effective or because it discriminates against the class of miners who were not so employed when the act became effective. It leaves the miner who had had two years experience in mining coal and was employed in mining coal in the State at the time the statute went into effect in the precise situation that he was in before it was passed, and permits him to continue his employment upon satisfying the Miners' Examining Board that he had been for two years engaged in mining coal and was engaged in mining coal in the State at the time the statute went into effect. It does not take from the miner who resides in the State or out of the State, and who had had two years' experience in mining, any privilege, right or immunity, but leaves such miner where it found him when the act was passed, without employment in a coal mine, and if he desires again to engage in mining, the statute requires that he may do so by passing an examination and otherwise complying with the act.

People v. Evans, 247 Ill. 547, p. 559.

The statute is not unconstitutional because the qualifications required of members of the Miners' Examining Boards exclude from such boards persons who are not practical and skillful miners of at least five years continuous experience and not actually engaged in the mining of coal in the county for which they are appointed. The right to be appointed or elected to an office is not a property right under the constitution, but a privilege and when an office is created by the legislature it may provide the qualifications required to hold such office and the fact that all the citizens of the state do not possess the qualifications required cannot affect the validity of a statute.

People v. Evans, 247 Ill. 547, p. 560.

The statute is not unconstitutional by the reason of the fact that it prohibits any person from entering a coal mine in the state unless he is selected, appointed or designated by some duly certificated miner. The statute provides that a certificated miner may have one uncertificated person working with him and under his direction for the purpose of learning the business of mining and qualifying to obtain a certificate in conformity to the statute. But the uncertificated persons mentioned are not to be selected and appointed by the certificated persons with whom and under whose direction they work, but such uncertificated persons must be employed by the mine owner or operator who pays them for their work.

People v. Evans, 247 Ill. 547, p. 562.

2. PURPOSE OF STATUTE—POLICE POWER.

The legislature in the exercise of the police power of the state may prescribe regulations for securing the admission of qualified persons to all callings which demand special knowledge, experience or skill and in no calling is there a more imperative demand for experience, knowledge and skill than in that of mining coal. The miner works underground by artificial light, surrounded by dangers, and unless protected from the negligence of operators and unskillfulness of his fellow miners a disaster may take place without a moment's warning, destroying the mine and all persons working therein, hence legislation is enacted for the purpose of protecting the miners from the negligent acts of mine operators. The purpose of this statute was to go a step further and protect the skilled workmen in coal mines as far as possible from the unskillfulness of unskilled laborers in the mine. This legislation was therefor provided with a view to make safe as far as possible the mining of coal, and concerning the preservation and health and lives of all that class of men who were engaged in mining coal in the state, and the statute is not in violation of the provisions of the constitution.

People v. Evans, 247 Ill. 547, p. 555.

3. MEMBERS OF BOARD—RESIDENCE AND QUALIFICATION.

This act does not require members of the Miners' Examining Boards to be appointed in the county in which they reside, but they must be "actually engaged in mining coal in the county for which they are appointed." The "residence" of the board means the place for which the members of the board may be appointed, and means a county in which they are actually engaged in the mining of coal.

People v. Evans, 247 Ill. 547, p. 561.

The residence of the Miners' Examining Board under the statute should be construed as authorizing the Miners' Examining Board of any county to examine all miners who reside in a county where no Miners' Examining Board has been appointed, or who reside outside of the state and desire to be examined with a view of becoming employed in coal mining in this state and in the county in which the board to which application for examination was made, has been appointed and was then in session. It is not intended to mean the county in which the members of the board may live.

People v. Evans, 247 Ill. 547, p. 561.

4. CERTIFICATED MINERS—EMPLOYMENT—CAPACITY.

A certificate under the act of 1909 authorizes the holder to be employed as and to do the work of miners. The certificate is evidence that the holder possesses the qualifications "to do the work of miners," but it does not necessarily show that he possesses the practical experience required of a shot firer.

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 390.

This act amends the act of 1908 and provides that certificates shall be issued to applicants found qualified upon examination which shall entitle the holder to be employed as and do the work of miners. The certificate is evidence that the holder possesses the qualifications to do the work of miners, but does not necessarily show that he possesses the practical experience required of a shot-firer.

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 390.

The statute does not authorize the employment of a miner as a shot-firer where his certificate of competency given him by the examining board gives him the right to seek employment as a "coal miner" merely and not as a "shot-firer."

Kulvie v. Bunsen Coal Co., 161 Ill. App. 617, p. 620.

Section 5 of the acts of 1907-8 and of 1909, and section 8 of the act of 1913, provide for examination and issuing of certificates to miners and require the board to keep an accurate record of the proceedings and to show a detailed account of the examination of each applicant. In an action where the question of the authority of a person to act as a certificated miner arises, proof of such fact must be made by the original record, unless it is shown that the production of such original record is impossible.

Kulvie v. Bunsen Coal Co., 161 Ill. App. 617, p. 621.

5. VIOLATION OF STATUTE—PENALTY.

The statute provides that no person shall engage as a miner in a coal mine without having obtained the proper certificate and makes the same a misdemeanor, but the act does not provide for a recovery of damages resulting from its violation.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 268.

There is a distinction and a difference between statutes that do and do not provide for the recovery of damages for injuries resulting from their violation.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 266.

MINERS' EXAMINING BOARD—APPROPRIATION.

LAWS 1913, 95, P. 107.

JUNE 20, 1913.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SEC. 1. Be it enacted, etc.: That the following sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc.:

*	*	*	*	*	*	*
Forty-fifth.	*	*	*			
To the State Mine (Miners') Examining Board				\$3,600	per annum.	
*	*	*	*	*	*	*

APPROPRIATION.

LAWS 1915, 265, P. 215.

JUNE 29, 1915.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SEC. 1. Be it enacted, etc.: That the following named sums be, and are hereby appropriated to meet the ordinary and contingent expenses of the State Government, etc.:

*	*	*	*	*	*	*
Forty-first.	To the State Mine (Miner's) Examining Board,	for clerk,	\$100	per month for twelve months	the sum of \$1,200;	for one stenographer \$720.00
						per annum;
						for stationery, \$25 per annum;
						for typewriter and supplies, \$100;
						for traveling expenses of members of the board, \$3,600 per annum.
*	*	*	*	*	*	*

MINERS' INSTITUTES.

MINERS' AND MECHANICS' INSTITUTES.

(REPEALED. SEE PAGE 439.)

LAWS 1911, P. 329.

MAY 25, 1911.

AN ACT to prevent accidents in mines and other industrial plants and to conserve the resources of the State by the establishment of Illinois Miners' and Mechanics' Institutes and for the administration and support of the same.

SECTION 1. Be it enacted, etc.: That in order to prevent accidents in mines and other industrial plants and to conserve the resources of the State, by the education and training of all classes of workers in and about the mines and other industrial plants of the State, there shall be established and maintained a form of educational betterment work, which shall be known as the Illinois Miners' and Mechanics' Institutes.

SEC. 2. That it shall be the purpose of such Illinois Miners' and Mechanics' Institutes to promote the technical efficiency of all persons working in and about the mines and other industrial plants of the State and to assist them to better overcome the increasing difficulties of mining and other industrial employments. In the development of this purpose, any and all means may be employed which promise to give desired results such as bulletins, traveling libraries, lectures, correspondence work, classes for systematic instruction, or meetings for the reading and discussion of papers.

SEC. 3. That the administration of the Illinois Miners' and Mechanics' Institutes, as provided in section 1 hereof, shall vest in the trustees of the University of Illinois; that all money appropriated by the State for the purpose of this Act shall be made available to said trustees; and that the said trustees be and hereby are authorized and directed to proceed with the work of the organization, maintenance and administration through their regularly authorized agents, aided by such other persons as in their judgment the work may require.

SEC. 4. The State Board of Contracts is hereby authorized and directed to provide all necessary printing for the Illinois Miners' and Mechanics' Institute, including such bulletins as may be published from time to time by the Illinois Miners' and Mechanics' Institutes.

APPROPRIATION.

LAWS 1913, 95, P. 119.

JUNE 30, 1913.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SEC. 1. Be it enacted, etc.: That the following sums be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, etc.

* * * * *

Ninety-fifth. * * *

For Miners and Mechanics Institute, \$15,000 per annum.

* * * * *

MINERS' LIENS.

LABORERS' AND MINERS' LIENS.

LAWS 1895, P. 242.

JUNE 21, 1895.

WAGES OF MINERS AND LABORERS AT COAL MINES LIENS ON ALL PROPERTY.

AN ACT to protect laborers and miners for labor performed in developing and working in coal mines.

SECTION 1. Be it enacted, etc.: That every laborer or miner who shall perform labor in opening and developing any coal mine, including sinking shafts, constructing slopes or drifts, mining coal and the like, shall have a lien upon all the property of the person, firm or corporation owning, constructing or operating such mine, used in the construction or operation thereof, including real estate, buildings, engines, cars, mules, scales and all other personal property, for the value of such labor for the full amount thereof, upon the same terms, with the same rights and to be secured and enforced as mechanics' liens are secured and enforced.

ANNOTATIONS.

1. MINERS EMPLOYED BY RECEIVER.

2. CHARACTER OF WORK—APPLICATION OF STATUTE.

1. MINERS EMPLOYED BY RECEIVER.

Under this statute miners who were employed by a receiver and who performed any of the labor specified in this statute are entitled to hold and enforce a lien under the statute for the value of the labor performed, and where such receiver is authorized to operate and improve the mine in order to preserve it.

Traylor v. Barry, 96 Ill. App. 644, p. 649.

2. CHARACTER OF WORK—APPLICATION OF STATUTE.

Miners employed in the ordinary mining of coal are not entitled to have a lien declared and enforced for such labor against the real estate of a mine operator consisting of 80 acres of land, machinery and appurtenances.

Borders v. Uhe, 88 Ill. App. 634, p. 636.

The statute of 1895 gives a lien for labor in opening and developing a mine. Such labor may consist in sinking shafts, constructing slopes or drifts, mining coal or the like, but to entitle the laborer to a lien such labor is restricted to "opening and developing mines." The court will not presume that when the legislature used these limiting words that nothing was meant by them or by so using them a lien was intended to be given on the real estate and the appurtenances of a mine to every miner who dug coal in the mine after it was opened and developed.

Borders v. Uhe, 88 Ill. App. 634, p. 636.

MINERS' WAGES—PAYMENT.

TRUCK SYSTEM PROHIBITED.

LAWS 1891, P. 212.

MAY 28, 1891.

AN ACT to provide for the payment of wages in lawful money, and to prohibit the truck system, and to prevent deductions from wages except for lawful money actually advanced.

SECTION 1. Be it enacted, etc.: That it shall be unlawful for any person, company, corporation or association, now engaged or hereafter to be engaged in any mining or manufacturing business in this State, to engage in, or be interested in, directly or indirectly, in keeping of a truck store, or controlling of any store, shop or scheme for the furnishing of supplies, tools, clothing, provisions or groceries to his its or their employees while so engaged in mining or manufacturing.

SEC. 2. Every person, company, corporation or association found guilty of violating section 1 of this act, either by himself, its or their agents, servants or employes, or partners, shall be guilty of a misdemeanor for each and every day such business is done in violation of said section, and on conviction will be liable to a fine for each offense of not less than fifty (50) nor more than two hundred (200) dollars, to be recovered in the name of the people, for the use of the school fund, and any person having knowledge of the fact that said section has been violated, may make complaint and cause summons or warrant to be issued.

SEC. 3. It shall be unlawful for any person, company, corporation or association, employing workmen in this State, to make deductions from the wages of his, its or their workmen, except for lawful money, checks or drafts actually advanced without discount, and except such sums as may be agreed upon between employer and employe, which may be deducted for hospital or relief fund for sick or injured employees.

SEC. 4. Any deductions made from the wages of any workman in this State, except as provided in section 3 of this act, may be recovered in any appropriate actions before any court of competent jurisdiction, together with such reasonable attorney's fee as the court in its discretion shall think proper, and no offset or counter claim of any kind shall be allowed in such action or proceeding.

SEC. 5. All attempts to evade or avoid the provisions of this act, by contract or otherwise, shall be deemed a violation thereof, and for every violation, in addition to the civil remedy provided for in section 4, there shall, on conviction, be a fine imposed of not less than fifty (50) nor more than two hundred (200) dollars for each offense.

SEC. 6. Nothing in this act shall be so construed as to include the business of farmers, or farm laborers, or servants.

ANNOTATIONS.

CONSTRUCTION AND VALIDITY OF STATUTE.

The first section of this act makes it unlawful for a person or corporation engaged in mining or manufacturing, to engage or be interested directly or indirectly in keeping or controlling any truck store, shop or scheme for the

furnishing of supplies, groceries, provisions or clothing to employees. The application of the section is not confined to sales on credit, nor to sales of articles paid in work, and no exceptions are made because of peculiar circumstances or occasions, however urgently the necessities of individuals require that there should be exceptions, but it applies under any and all circumstances, to either keeping or controlling any store, shop or scheme for furnishing such supplies, provisions, groceries or clothing to employees by the operator of a mine or manufactory while engaged in mining or manufacturing.

Frorer v. People, 141 Ill. 171, p. 176;
Ramsey v. People, 142 Ill. 380, p. 384;
Kellyville Coal Co. v. Harrier, 207 Ill. 624, p. 627.

While the prohibition of this statute includes by name only the person, company, corporation or association engaged in mining or manufacturing, yet it includes equally within its scope their employees for the employee is necessarily denied the right to contract with one who is forbidden by the law to possess, for the purpose of contracting with him, the articles about which he wishes to contract. The legal meaning of the section would not be changed if it prohibited the employees from contracting with their employer for the purchase of the property in which it is made unlawful for their employer to have any ownership.

Frorer v. People, 141 Ill. 171, p. 176;
Kellyville Coal Co. v. Harrier, 207 Ill. 624, p. 629.

The prohibition of the statute operates not directly upon the business of mining but upon the individual because of his participation in that business. It is not imposed for the purpose of rendering mining less perilous, nor to restrict or regulate the duties of employer and employee in respects peculiar to this industry; but the statute imposes disabilities in contracting as to tools, provisions, clothing and food, matters as to which all laborers in every other branch of industry are permitted to contract with their employers without restriction. The statute prohibits a mine operator and a manufacturer from doing the enumerated things, but permits any person or corporation other than one engaged in mining and manufacturing to do the prohibited things. Employers in other industries may do for their pecuniary gain with impunity and have the law to protect them, but the miner and manufacturer under precisely the same circumstances and conditions are prohibited from doing for their pecuniary gain. The prohibited acts if done by a miner or manufacturer are unlawful and punishable by fine, but if done by any other persons or corporation is lawful and they are protected. Under these circumstances sections 1 and 2 of the act are repugnant to the Constitution and therefore invalid.

Frorer v. People, 141 Ill. 171, p. 17;
Braceville Coal Co. v. People, 147 Ill. 66, p. 70;
Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54;
Kellyville Coal Co. v. Harrier, 207 Ill. 624, p. 627.

WEEKLY PAYMENT.

LAW 1801, P. 213.

APRIL 23, 1891.

AN ACT to provide for the weekly payment of wages by corporations.

SECTION 1. Be it enacted, etc.: That every manufacturing, mining, quarrying. * * * company shall pay weekly each and every employe engaged in its business, the wages earned by such employe to within six days of the date of such payment: Provided, however, that if at any time of payment any employe shall be absent from his regular place of labor, he shall be entitled to said payment at any time thereafter upon demand.

SEC. 2. Any corporation violating any of the provisions of this act shall be liable to a penalty not exceeding fifty dollars, and not less than ten dollars for each violation, to be paid to the People of the State, and which may be recovered in a civil action: Provided, an action for such violation is commenced within thirty days from the date thereof; any person may bring an action in the name of the People of the State, as plaintiff, against any corporation which neglects to comply with the provisions of this act for a period of two weeks, after having been notified in writing by such person that such action will be brought. On the trial of such action, such corporation shall not be allowed to set up any defense for a failure to pay weekly any employe engaged in its business the wages earned by such employe to within six days of the date of such payment, other than a valid assignment of such wages, or a valid set-off against the same, or the absence of such employe from his regular place of labor at the time of payment, or an actual tender to such employe at the time of payment of the wages so earned by him, or a breach of contract by such employe or a denial of the employment. No assignment of future wages payable weekly under the provisions of this act shall be valid if made to the corporation from whom such wages are to become due, or to any person on behalf of such corporation, or if made or procured to be made to any person for the purpose of relieving such corporation from the obligations to pay weekly under the provisions of this act. Nor shall any of said corporations require any agreement from any employe to accept wages at other periods than as provided in section 1 of this act, as a condition of employment.

SEC. 3. The penalties herein provided may be recovered in any court having civil jurisdiction by (of) such in the name of the person bringing the same.

NOTE.—This act is evidently impliedly repealed by the act of June 21, 1913. See page 110.

ANNOTATIONS.

CONSTRUCTION AND VALIDITY OF STATUTE.

The privilege of contracting is both a liberty and property right, and if one person is denied the right to contract and acquire property in the manner in which he hitherto enjoyed under the law and which other are still allowed under the law to enjoy, he is deprived of both liberty and property to the extent that he is thus denied the right to contract. The people, in their respective capacity may, by general law, render that unlawful in many cases which had hitherto been lawful, but laws depriving particular persons or classes of persons of rights enjoyed by the community at large to be valid, must be based upon some existing, distinct reason not applicable to others not included within the provision. The prohibitory provisions of this act are limited to mining and certain other named corporations while other corporations organized and doing business in the state and employing large numbers of men are not included in the list enumerated in this statute. No reason can be found that would require weekly payments to the employees of the corporations named that would not require like payment to the employees of the corporations not named. The act is therefore a restriction on the right to contract and is therefore unconstitutional.

Braceville Coal Co. v. People, 147 Ill. 66, p. 71;

Harding v. People, 160 Ill. 459, p. 465.

PAYMENT IN MONEY.

LAWS 1897, P. 270.

JUNE 3, 1897.

AN ACT to provide for the payment of coal miners for all coal mined by them, and providing additional duties for mine inspectors.

SECTION 1. Be it enacted, etc.: That every person engaged in mining coal for any corporation, company, firm or individual, shall be paid in lawful money of the United States for all coal mined and loaded into the mining car by such person for such corporation, company, firm or individual, including lump, egg, nut, pea and slack, or such other grades as said coal may be divided into, at such price as may be agreed upon by the respective parties.

SEC. 2. It shall be the duty of the mine inspector to ascertain whether or not the provisions of section 1 of this Act are being complied with in his district, and if he shall find that any corporation, company, firm or individual are violating the provisions of section 1 of this Act, it shall be his duty to at once have instituted suit in the name of the People of the State of Illinois, in some court of competent jurisdiction, for the recovery of the penalty provided for in this Act, and it shall be the duty of the State's Attorney of the county in which such suit is brought, when notified by the mine inspector, to prosecute such suit, as provided by law in other State cases.

SEC. 3. Every corporation, company, firm or individual violating the provisions of this Act shall be fined not less than \$25.00 nor more than \$200.00 for each offense.

Approved June 3, 1897, in force July 1, 1897.

ANNOTATIONS.

VALIDITY AND PURPOSE OF ACT—EFFECT ON CONTRACTS.

The court will not ascribe to the legislature an intention to reenact by this statute in a somewhat different form a provision designed to interfere with the freedom of contracting between citizens and which has been uniformly held to be an encroachment upon the liberty and rights of the employer and employee. Before the passage of this act the court had decided that it was not competent for the legislature to compel owners and operators of coal mines to make their contracts by the weight of the coal mined or to require the laborer to have his wages determined by weight.

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 53.

See *Millett v. People*, 117 Ill. 294.

It was the design of the legislature to eliminate from this act the objectionable features of former enactments by making contracts enforceable according to their terms instead of attempting to make contracts for the parties. It is made essential to a violation of this act that a price shall be agreed upon by the respective parties including the various grades of coal specified in the act. It may be satisfactory for the parties to agree upon a less price to be paid on the basis of "run of mine" or unscreened coal than when the payment is made on the basis of the screened product; and a contract at a higher price per ton for screened coal without any payment for nut and slack coal mined, is not a violation of the statute.

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54.

See *Ramsey v. People*, 142 Ill. 380;

Harding v. People, 160 Ill. 459.

Where a coal mine operator paid to a miner for the coal mined by him under and pursuant to an agreement which had been carried out for six years, and

where the higher price per ton paid for screened lump coal was intended by the parties to the contract as payment for the coal mined, and where no price had been agreed upon by the parties for the payment of nut and slack coal mined, of which no account was taken by them, there is no violation of the statute, and under such circumstances an operator can not be held guilty on the ground that he failed to pay for the nut and slack coal mined.

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 55.

This act does not require that the same price shall be paid for each of the different grades into which coal may be divided, but only undertakes to require that the employer shall perform his contract by paying at such price as may be agreed upon by the operator and miner.

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 53.

SEMIMONTHLY PAYMENT.

LAWS 1912, P. 248.

JUNE 21, 1913.

AN ACT in relation to the semimonthly payment of wages and salaries by corporations for pecuniary profit, and providing penalty for violation of same.

SECTION 1. Be it enacted, etc.: That every corporation for pecuniary profit engaged in any enterprise or business within the State of Illinois, shall as often as semi-monthly pay to every employee engaged in its business all wages or salaries earned by such employee to a day not more than eighteen (18) days prior to the date of such payment. Any employee who is absent at the time fixed for payment, or who for any other reason is not paid at that time, shall be paid thereafter at any time upon six days' demand, and any employee leaving his or her employment or discharged therefrom, shall be paid in full following his or her dismissal or voluntary leaving his or her employment, at any time upon three days' demand. No corporation coming within the meaning of this Act, shall by special contract with employees or by any other means secure exemption from the provision of this Act. And each and every employee of any corporation coming within the meaning of this Act shall have his or her right of action against any such corporation for the full amount of his or her wages due on each regular pay day as herein provided in any court of competent jurisdiction of this State.

SEC. 2. Any corporation coming within the meaning of this Act violating section one (1) of this Act, shall be deemed guilty of a misdemeanor and fined in a sum not less than twenty-five dollars (\$25.00) or more than one hundred dollars (\$100.00) for each separate offense and each and every failure or refusal to pay each employee the amount of wages due him or her at the time, or under the conditions required in section 1 of this Act, shall constitute a separate offense.

NOTE.—This act evidently repeals by implication the act of April 23, 1891, requiring weekly payment of wages. See page 107.

MINERS' WASH ROOMS.

MINE OPERATORS TO PROVIDE WASH ROOMS.

LAWS 1908, P. 282.

MAY 14, 1908.

AN ACT to require owners and operators of coal mines to provide every coal mine with wash rooms for the use of the miners therein employed.

SECTION 1. Be it enacted, etc.: That every owner or operator of a coal mine in this State shall provide and maintain a wash room at a convenient place at the top of each mine for the use of the miners and other employes of such mine; and such wash room shall be so arranged that such miners and other employes may hang therein their clothes, for the purpose of drying the same.

SEC. 2. Any mine owner or operator who shall fail or refuse to comply with the provisions of this act shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be fined not more than one hundred dollars, and shall stand committed to the county jail until such fine is fully paid.

ANNOTATION.

STATUTE UNCONSTITUTIONAL.

This statute places upon mine owners or operators a burden not borne by other employers of labor and is special legislation and for that reason invalid. The evil at which this statute is aimed is one that is not visited alone on employers in coal mines. The legislature can not ameliorate the coal miners' condition under the guise of an exercise of the police power and leave others unaided who suffer from like causes. The fact that the constitution imposes upon the general assembly the duty to pass laws for the protection of operative miners does not save this statute from the charge of being unconstitutional, as the constitutional provision applies solely as respects their personal safety and does not include general health regulations.

Starne v. People, 222 Ill. 189, p. 193.

See Millett v. People, 117 Ill. 294;

Frorer v. People, 141 Ill. 171;

Braceville Coal Co. v. People, 147 Ill. 66;

Harding v. People, 160 Ill. 459;

Edin v. People, 161 Ill. 296;

Bailey v. People, 190 Ill. 28;

Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 517;

Morgan, In re, 26 Colo. 415;

People v. Solomon, 265 Ill., p. 32;

Spring Valley Coal Co. v. Greig, 129 Ill. App. 386, p. 392.

EMPLOYERS TO PROVIDE WASH ROOMS.

LAWS 1913, P. 359.

JUNE 26, 1913.

AN ACT to provide for wash rooms in certain employments to protect the health of employees and secure public comfort.

SECTION 1. Be it enacted, etc.: That every owner or operator of a coal mine, steel mill, foundry, machine shop, or other like business in which employees become covered with grease, smoke, dust, grime and perspiration to such extent

that to remain in such condition after leaving their work without washing and cleansing their bodies and changing their clothing, will endanger their health or make their condition offensive to the public, shall provide and maintain a suitable and sanitary wash room at a convenient place in or adjacent to such mine, mill, foundry, shop or other place of employment for the use of such employees.

SEC. 2. Such wash room shall be so arranged that employees may change their clothing therein, and shall be sufficient for the number of employees engaged regularly in such employment; shall be provided with lockers in which employees may keep their clothing; shall be provided with hot and cold water and with sufficient and suitable places and means for using the same; and during cold weather, shall be sufficiently heated.

SEC. 3. It shall be the duty of the State and county mine inspectors, factory inspectors and other inspectors required to inspect places and kinds of business required by this Act to be provided with wash rooms, to inspect such wash rooms and report to the owner or operator, the sanitary and physical condition thereof in writing, and make recommendations as to such improvements or changes as may appear to be necessary for compliance with the provisions of this Act.

SEC. 4. Any owner or employer who shall fail or refuse to comply with the provisions of this Act shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not more than one hundred dollars.

SEC. 5. Any owner or employer who shall be convicted of a violation of the provisions of this Act, shall be subject to a conviction for succeeding offenses for each and every day he shall neglect or refuse to comply herewith.

ANNOTATIONS.

1. STATUTE CONSTITUTIONAL.
2. PURPOSE OF STATUTE.

1. STATUTE CONSTITUTIONAL.

This statute is not unconstitutional on the ground that the act places a burden upon employers of labor in certain employments, and not upon corporations and persons employing labor in similar employments; nor is it void as being unreasonable, uncertain and ambiguous.

People v. Solomon, 265 Ill. 28, p. 30.

If this act could be continued as an act intended directly to accomplish by different means the three-fold purpose of providing wash rooms, protecting the health of employees, and securing public comfort, then there might be the same ground for the contention that it is invalid because the act embraces more than one subject not expressed in the title.

People v. Solomon, 265 Ill. 28, p. 31.

The legislature can not require the owner or operators of coal mines only to provide and maintain wash rooms for their employees, as this would place upon the mine owner or operator a burden not borne by other employers of labor, and such an act would be special legislation and invalid. Any valid act of this kind must apply to all employers of labor similarly situated or to all employers of labor where conditions are such as would require wash rooms.

People v. Solomon, 265, Ill. 28, p. 32.

See *Starne v. People*, 222 Ill. 189.

The court in the construction of this act must assume that the legislature in its enactment had before it the decision of the court in the former case, and that the intention of the legislature was to avoid the defects in the former

law pointed out by the court and that it intended to enact a statute that would not be open to the same objections.

People v. Solomon, 265 Ill. 28, p. 33.

See Starne v. People, 222 Ill. 189.

This act is not invalid and unconstitutional because it enumerates certain specified employments and generalizes as to others. By a fair construction it applies not only to the employments named but to all other like businesses of an established or permanent character in which the "employees become covered with grease, smoke, dust, grime and perspiration to such extent that to remain in such condition after leaving their work without washing and cleaning their bodies and changing their clothing will endanger their health or make their condition offensive to the public." The law must be held to apply to employments in which the conditions exist that make such a law necessary and it cannot be special or class legislation.

People v. Solomon, 265 Ill. 28, p. 33.

2. PURPOSE OF STATUTE.

The purpose of this law is to promote the health and welfare of employees in certain lines of business where the conditions are such that every facility should be afforded for cleanliness, and to provide for the comfort and welfare of those with whom such employees come in contact after leaving their places of employment. The general assembly has the right under the police power of the State to enact such regulation, although it may to some extent interfere with private property rights and impose conditions on the use of the property. The legislature has the power to enact such laws as may be found necessary and appropriate to promote the health, comfort, safety, and welfare of society.

People v. Solomon, 265 Ill. 28, p. 34.

MINING CORPORATIONS.

FORMATION OF MINING CORPORATIONS.

LAWS 1849, P. 87.

FEBRUARY 10, 1849.

AN ACT to authorize the formation of corporations for manufacturing, agricultural, mining, or mechanical purposes.

SECTION 1. Be it enacted, etc.: That at any time hereafter, any three or more persons who may desire to form a company for the purpose of carrying on any kind of manufacturing, agricultural, mining or mechanical business, may make, sign, and acknowledge, before some officer competent to take the acknowledgement of deeds, and file in the office of the clerk in the county in which the business of the company shall be carried on, and a duplicate thereof in the office of the secretary of state, a certificate in writing, in which shall be stated the corporate name of the said company, and the objects for which said company shall be formed, the amount of capital stock of said company, the term of its existence not to exceed — years, the number of shares of which the said stock shall consist, the number of trustees and their names, who shall manage the concerns of said company for the first year, and the name of the town and county in which the operations of said company are to be carried on.

* * * * *

SEC. 10. All the stockholders of every company incorporated under this act shall be severally individually liable to the creditors of the company in which they are stockholders, to an amount equal to the amount of stock held by them respectively, for all debts and contracts made by such company, until the whole amount of capital stock fixed and limited by such company shall have been paid in, and a certificate thereof shall have been made and recorded as is prescribed in the following section; and the capital stock, so fixed and limited shall all be paid in, one-half within one year, and the other half thereof within two years from the incorporation of said company, or such corporations shall be dissolved.

* * * * *

SEC. 19. Any corporation or company heretofore formed, by special act or under the general law, and now existing for any manufacturing, agricultural, mining, or mechanical purposes, or any company which may be formed under this act, may increase or diminish its capital stock by complying with the provisions of this act, to any amount which may be deemed sufficient and proper for the purposes of the corporation, and may also extend its business to any other manufacturing, mining or mechanical business, subject to the provisions and liabilities of this act. * * *

AMENDATORY ACT, 1857.**LAWS 1857, P. 93.****FEBRUARY 10, 1857.**

AN ACT to amend "An act to authorize the formation of corporations for manufacturing, agricultural, mining and mechanical purposes," approved February 10, 1849. (Laws 1849, p. 87.)

SECTION 1. Be it enacted, etc.: It shall be lawful for all companies formed and incorporated, or which shall hereafter be incorporated under the provisions of "An act to authorize the promotion of companies for manufacturing, agricultural, mining or mechanical purposes," approved February 10th, A. D. 1849, to sue for and collect any installment or subscription to stock due or to become due to said companies formed under said act in like manner as other debts are now collected, and before any court having jurisdiction of the amount claimed.

SEC. 2. This act to be deemed a public act and be in force from and after its passage.

MINING AND TRANSPORTATION COMPANIES.**LAWS 1852, P. 135.****JUNE 22, 1852.**

AN ACT to authorize the formation of corporate companies for the purpose of mining and transportation, by general law.

SECTION 1. Be it enacted, etc.: That any three or more persons who may desire to form a company for the purpose of mining, or for the transportation of coal, or other products or commodities, may be incorporated for that purpose in the manner following, to wit: Such persons shall make, sign and acknowledge, before some officer authorized to take acknowledgements of deeds, articles of association, in which shall be fully set forth the description and kinds of business they propose to pursue, the name they assume, the location of the said company, which shall be within this state, the number of years it is to exist, which shall not exceed thirty years from the date of said articles, the amount of capital stock of said company, which shall in no case exceed three hundred thousand dollars, the amount and number of shares composing said stock, and such other particulars as may be deemed proper, and upon filing said articles of association, signed and acknowledged as aforesaid, in the office of the secretary of state, and a duplicate thereof in the office of the county clerk of the county wherein said company may be located, the persons aforesaid, and all persons who shall, from time to time, become stockholders and associates in said company, their heirs and assigns, shall be known by the name assumed, and considered in law a body corporate, and shall possess all the powers and privileges, and be subject to all the restraints and liabilities of bodies corporate; may have and use a common or corporate seal and alter the same at pleasure, and by their name assumed sue and be sued, plead and be impleaded, as natural persons, in all or any of the courts of this state having jurisdiction of the subject matter, and the copy of any such articles of association, filed in pursuance of this act, certified by the secretary of state, or by said county clerk or his deputy, to be a full and true copy of such articles of association, shall be taken in all courts and places as presumptive evidence of the facts therein stated and of the legal existence of said company.

SEC. 2. The stock, property and business of the said company shall be managed by not less than three or more than nine directors, who shall respectively be stockholders in said company, and one of whom shall be appointed president; and the said president and directors, or a majority of them, or a ma-

majority of the directors in the absence of the president, shall constitute a board or quorum for the transaction of business, and all questions shall be decided by a majority of votes. The first board of directors may be chosen or appointed at such time and place and in such manner as the members of said corporation may see proper, to hold their offices for one year and until their successors are elected to fill their places. After the first election or appointment the said board of directors shall be elected annually, by the stockholders of said company, at such time and place as shall be determined by the by-laws of said company; public notice of the time and place of holding such elections shall be published not less than thirty days previous thereto, in some newspaper published in the county, or nearest the place where the business of said company may be carried on, when there shall be no paper published in said county. The election shall be made by ballot, and by such of the stockholders as shall attend for that purpose, either in person or by proxy, and each stockholder shall be entitled to cast as many votes as he may own shares of stock in said company, and the person receiving the greatest number of votes shall be the director of said company for the year next ensuing, and until their successors shall be elected to take their places. When a vacancy shall occur in the board, by death or otherwise, it may be filled for the remainder of the term in such manner as shall be provided by the by-laws of said company, and in case it shall happen at any time that an election of directors shall not be made on the day designated by the by-laws of the company when it ought to have been made, the said company for that reason shall not be dissolved, but it shall be lawful on any other day to hold an election, upon notice as aforesaid, and all the acts of the directors shall be valid and binding as against said company, until their successors shall be elected and organized by the election of their president.

SEC. 3. The board of directors and their successors shall have power to make and pass such by-laws, rules and regulations for the government of said company and the management of its affairs and business, for the election of a secretary and treasurer, (or the secretary may act as treasurer, *ex officio*,) and such agents and servants as they may deem proper, prescribe their duties, fix their remuneration, require bonds for the faithful performance of their respective duties, and all other matters that shall be deemed necessary to promote the interest of said company, not inconsistent with this act, the laws and constitution of this state or of the United States—a copy of which, duly certified by the president, attested by the secretary and under the seal of said company, shall be filed in the office of the clerk of the county wherein said company shall be located, and shall be as binding on said company, its officers and agents, in every respect as if the same had been incorporated in this act. The said directors may cause books to be opened for subscriptions to their capital stock, in such manner and at such times and places as they shall deem proper, and issue certificates of stock to the said stockholders, and it shall be lawful for the directors to call in and demand from the stockholders, respectively, all such sums of money by them subscribed, at such times and in such payments or installments as the directors shall deem proper, under the penalty of forfeiting the shares of stock subscribed for and all previous payments made thereon, if payment shall not be made by the stockholders, their heirs or legal representatives, within sixty days after a personal notice or demand, or notice requiring such payment shall have been published for six successive weeks in a newspaper published in the county in which said company is located, or in a newspaper published nearest thereto. The stock of said company shall be deemed personal property and transferable in such manner as shall be prescribed by the by-laws of said company, but no certificate of stock shall be

transferable until all calls and instalments are fully paid in, or whilst the holder of said certificates of stock shall be indebted to said company, without the written consent of the directors, and all or any transfer so made, without the written consent of the directors as aforesaid, shall be null and void as against said company. The said company shall have and hold the first lien on the stock for any and all debts due from the holder thereof to the said company, and may be reached by judgment and execution, the same as other personal property under the laws of this state, and when any such stock shall be declared forfeited to the company by reason of non-payment of the instalments thereon, or purchased in for debt at public sale, the same numbers and amounts may be again subscribed for by any other person, and certificates issued therefor, the same as if it had been an original subscription.

SEC. 4. The said company may purchase, hold, sell and convey at their pleasure, all such real estate as shall be deemed necessary for their interest and business operations, not exceeding at any one time twenty-five per centum of their capital stock, and to take and hold any real estate mortgaged or pledged as security for the payment of any debt due or to become due to said company, or to take and receive any real estate or other property in payment, or towards the satisfaction of any debt previously due to said company, and to hold the same until they can conveniently and advantageously sell and convert the same into money or other property. All conveyances of real estate to said company, and all bonds, notes, obligations or agreements with or to said company, shall be made in the corporate name of said company, and all conveyances of real estate made by said company shall be made in the corporate name thereof, signed and acknowledged by the president, bearing the seal of the company and attested by the secretary, and the same so made shall be valid in law or equity. All business transactions, and all notes, bills, bonds or obligations, made or entered into by said company, shall run in the name of said company, and may be signed by the president, secretary or agent of said company, as the said company may by their laws; rules or regulations determine. All suits for or against said company shall be brought, prosecuted or defended by the corporate (name) thereof, and all process against said company shall be by summons, and the service of the same shall be by leaving an attested copy thereof with the treasurer at least thirty days before the return thereof.

SEC. 5. Said company shall have power to possess, have and hold personal property to the extent that may be necessary for their business operations, and to sell, exchange or dispose of the same at pleasure, to borrow money and secure the payment thereof, by bond, mortgage or otherwise; to be the owner or part owner of docks, depots, warehouses, tenements, water-craft appliances, and every species of property necessary to carry out the object of their organization and for developing the resources of this state, by mining for coal or other minerals, transporting the same or other products, commodities, passengers or property, from or to their place of business, by land or water; to effect insurance upon their property; to divide their earnings and profits with the stockholders of said company, or to employ their funds in any other lawful manner.

SEC. 6. The said company shall keep at the office of their secretary or treasurer, at the place of their location, well bound and substantial books, in which shall be kept a full and correct record of the names of the stockholders, their place of residence, the amount held by each respectively, the date of the subscription, the amount paid in, and of all transfers of stock, the date of such transfer, from whom and to whom transferred; also a record of all the proceedings of the board of directors, by-laws, rules and regulations made for the government and management of the said company and its business operations;

which said books shall be subject to inspection at all reasonable times, during business hours, by any stockholder or creditor of said company, under the penalty of fifty dollars, to be recovered by suit against said company by any person who shall be refused the use and inspection of said books, being a stockholder or creditor of said company, at a proper time and upon request of the officers who may have the said book or books in charge, and at the end of each current year the said board of directors shall cause to be made out a tabular statement, showing the amount of the capital stock paid in, the amount of property owned by the company, real and personal, the amount of debts due to the company, and the amount of the said company's indebtedness, and also showing the profit or loss of said company; which said tabular statement shall be liable and subject to inspection, in the same manner and under the same penalty as is provided in relation to the books of said company. The said company in their corporate name may have their action at law or equity, before any court in this state having jurisdiction of the subject matter, and if the sum demanded be one hundred dollars or less, any justice of the peace shall have jurisdiction as in other cases against any and all persons in debt, damages or other action for the recovery of any debt or other matter, notwithstanding the said person or persons against whom suit is brought, may be stockholders in said company, and the law of partnership shall in nowise apply or be plead in bar or set up in defence of such action. The stock, property and effects of said company shall be liable and subject to execution for all debts due or owing by said company to any person or persons, company or corporation, and any transfer or assignment of property made by said company to any person, for the purpose of giving preference to any one or more of its creditors, shall be null and void as against all other creditors of said company. It shall not be lawful for said company at any time to contract debts, or be indebted at any one time in any amount over fifty per cent. of the amount of their capital stock actually paid in, and the directors of said company in office at the time of contracting such debts, and consenting thereto or assenting thereto, by not protesting against such contracting of debts, and giving notice of such protest, shall be jointly and severally liable for all such excess of debts over fifty per cent. of the amount of their capital stock actually paid in as aforesaid.

Sec. 7. This act shall be taken and considered as a public act, in all courts and places, shall be liberally construed in favor of any and all companies organized by virtue hereof, and shall take effect and be in force from and after its passage.

Sec. 8. The powers conferred by this act shall not be so construed as to authorize any company organized under the same to enter upon the business of transportation upon any waters within this state, for the purpose of carrying freight and passengers, or passengers only, but the word "transportation," whenever used in this act, shall be so construed as to confine said corporation to the transportation incident to and connected with their mining operations.

AMENDATORY ACT, 1865.

LAW 1865, P. 23.

FEBRUARY 16, 1865.

AN ACT to amend an act entitled, "An act to authorize the formation of corporate companies for the purpose of mining and transportation," by a general law, approved June 22, 1852.

SECTION 1. Be it enacted, etc.: That the above entitled act be, and is hereby so amended as to allow said companies to invest such portion of their capital stock in such real estate as may be deemed necessary, for the successful prose-

cution of the business of mining and transportation, and also so amended as to allow persons forming themselves into such corporate companies to provide in their articles of association, that the stockholders shall constitute the board of directors provided for by said act, voting in person or by proxy, at all meetings of said company under such rules and regulations as may be prescribed in said articles of association.

FORMATION OF CORPORATIONS.

LAWS 1857, P. 161.

FEBRUARY 18, 1857.

AN ACT to authorize the formation of corporations for manufacturing, mining, mechanical or chemical purposes.

SECTION 1. Be it enacted, etc.: Any three or more persons who may desire to form a company for the purpose of carrying on any kind of manufacturing, mining, mechanical or chemical business may make, sign and acknowledge before some officer competent to take the acknowledgment of deeds, and file in the office of the clerk of the circuit court of the county in which the business of the company is to be carried on, and also in the office of the secretary of state, a certificate in writing, in which shall be stated the corporate name of the said company, the object for which it is formed, the amount of the capital stock thereof, the term of its existence, the number of shares of which the said stock shall consist, the number of directors, and the names of the persons who shall be directors for the first year, and the names of the town and county in which the operations of the said company are to be carried on.

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AMENDATORY ACT, 1859.

LAWS 1859, P. 28.

FEBRUARY 24, 1859.

AN ACT to amend an act entitled "An act to authorize the formation of corporations for Manufacturing, Mining, Mechanical or Chemical purposes," approved February 18th, 1857. (Laws 1857, p. 161.)

SECTION 1. Be it enacted, etc.: That any corporations, formed under and by virtue of the aforesaid act, or any persons who may wish to form a corporation under the same, and who may be desirous of doing or carrying on business in more than one place or county, may file the certificates required to be filed by sections 1, 10 and 17 of said act in the clerk's office of the county in which their general office shall be kept; and in such case the certificate shall set forth in what town and county their general office will be kept.

SEC. 2. Any corporation formed under said act, for the purpose of carrying on mining or manufactures of wood, shall have the right to purchase and hold such mineral and timber lands as they shall deem essential to provide themselves with material for the future operation of said company.

ANNOTATIONS.

EMINENT DOMAIN—RIGHT OF WAY.

A corporation organized under the general corporation act for the purpose of mining and selling coal is not authorized to appropriate by condemnation proceedings a right of way for a tramway from its coal mine to a line of railroad, as its use would be a private use and not a public use in the sense of the constitution.

Sholl v. German Coal Co., 118 Ill. 427, p. 430.

See Millett v. People, 117 Ill. 294;

Edgewood Railroad Co's, App. 79 Pa. St. 257.

COMBINES, POOLS, TRUSTS, ETC.**LAWS 1891, P. 206.****JUNE 11, 1891.**

AN ACT to provide for the punishment of persons, copartnerships or corporations forming pools, trusts and combines, and mode of procedure and rules of evidence in such cases.

SEC. 1. Be it enacted, etc.: If any corporation organized under the laws of this or any other State or country, for transacting or conducting any kind of business in this State, or any partnership or individual or other association of persons whosoever, shall create, enter into, become a member of or a party to any pool, trust, agreement, combination, confederation or understanding with any other corporation, partnership, individual, or any other person, or association of persons, to regulate or fix the price of any article of merchandise or commodity, or shall enter into, become a member of or a party to any pool, agreement, contract, combination or confederation to fix or limit the amount or quantity of any article, commodity or merchandise to be manufactured, mined, produced or sold in this State, such corporation, partnership or individual or other association of persons shall be deemed and adjudged guilty of a conspiracy to defraud, and be subject to indictment and punishment as provided in this act.

SEC. 2. It shall not be lawful for any corporation to issue or to own trust certificates, or for any corporation, agent, officer or employes, or the directors or stockholders of any corporation, to enter into any combination, contract or agreement with any person or persons, corporation or corporations, or with any stockholder or director thereof, the purpose and effect of which combination, contract or agreement shall be to place the management or control of such combination or combinations, or the manufactured product thereof, in the hands of any trustee or trustees, with the intent to limit or fix the price or lessen the production and sale of any article of commerce, use or consumption, or to prevent, restrict or diminish the manufacture or output of any such article.

SEC. 3. (Punishment of corporation for violation.)

SEC. 4. (Punishment of officers for violation.)

SEC. 5. Any contract or agreement in violation of any provision of the preceding sections of this act shall be absolutely void.

SEC. 6. Any purchaser of any article or commodity from any individual, company or corporation transacting business contrary to any provision of the preceding sections of this act shall not be liable for the price or payment of such article or commodity, and may plead this act as a defense to any suit for such price or payment.

* * * * *

FIRST AMENDATORY ACT, 1893.**LAWS 1893, P. 89.****JUNE 20, 1893.**

AN ACT to amend an act entitled "An Act to provide for the punishment of persons, copartnerships, or corporations forming pools, trusts and combines."

NOTE.—This amendatory act adds two additional sections for enforcing the original act, but makes no other changes.

SECOND AMENDATORY ACT, 1897.**LAWS 1897, P. 296.****JUNE 10, 1897.**

AN ACT to amend section one of an act entitled, "An act, etc. (same as in section 1)."

SEC. 1. Be it enacted, etc.: That section one of an act entitled "An act to provide for the punishment of persons, partnerships, or corporations forming pools, trusts and combines, and mode of procedure and rules of evidence in such cases," approved June 11, 1891, in force July 1, 1891, be amended to read

as follows: If any corporation organized under the laws of this or any other state or country for transacting or conducting any kind of business in this State, or any partnership or individual or other association of persons who-soever, shall create, enter into, become a member of or a party to any pool, trust, agreement, combination, confederation, or understanding with any other corporation, partnership, individual or any other person or association of persons, to regulate or fix the price of any article of merchandise or commodity, or shall enter into, become a member of or party to any pool, agreement, contract, combination or confederation to fix or limit the amount or quantity of any article, commodity or merchandise to be manufactured, mined, produced or sold in this State, such corporation, partnership, or individual or other association of persons shall be deemed and adjudged guilty of a conspiracy to defraud and be subject to indictment and punishment as provided in this act: Provided, however, that in the mining, manufacture or production of articles of merchandise, the cost of which is mainly made up of wages, it shall not be unlawful for persons, firms, or corporations doing business in this State to enter into joint arrangements of any sort, the principal object or effect of which is to maintain or increase wages.

NOTE.—This act purports to amend an act already amended.

ANNOTATIONS.

1. UNLAWFUL COMBINATIONS—SUFFICIENCY OF CHARGE.
2. MINING CORPORATIONS—CLASSIFICATION.
3. CONSTRUCTION AND VALIDITY OF STATUTE.
4. CONSTITUTIONALITY OF AMENDMENTS.

1. UNLAWFUL COMBINATIONS—SUFFICIENCY OF CHARGE.

A combination the tendency of which is to prevent general competition and to control prices is detrimental to the public and consequently unlawful.

Chicago, Wilmington & Vermilion Coal Co. v. People, 214 Ill. 421, p. 442;

United States v. Jellico Mountain Coke & Coal Co., 47 Federal 432;

Morris' Run Coal Co. v. Barkley Coal Co., 68 Pa. St. 173;

Chicago, Wilmington & Vermilion Coal Co. v. People, 114 Ill. App. 75.

By this act it is made a criminal offense to enter into an agreement to regulate or fix the price of any article of merchandise or commodity manufactured, mined, produced, or sold in the State. A distinction is recognized between a conspiracy to do an illegal act and the actual performance of the act as provided by this antitrust act of 1891.

Chicago, Wilmington & Vermilion Coal Co. v. People, 214 Ill. 421, p. 453;

Chicago, Wilmington & Vermilion Coal Co. v. People, 114 Ill. App. 75.

A mere tacit understanding between conspirators to work to a common purpose is all that is essential to a guilty actionable combination under this statute. Individual intent by two or three persons to do an unlawful act or a lawful act by unlawful means is the first step in that regard. Next follows concurrence between such persons, not concurrence of action merely, but concurrence in mental intent to effect the common purpose, each to aid the other in that regard. Mutuality in the undertaking may be secured without any express agreement and without a spoken or written word between the conspirators or a meeting of the members of the combine or their even all knowing each other, or the precise thing to be accomplished or plans for its accomplishment either in a general way or in detail being distinctly stated by any member of the combine to any other member. If there is a meeting of minds brought about in

any way to accomplish a common purpose the essentials of a guilty combination are all satisfied.

Chicago, Wilmington & Vermillion Coal Co. v. People, 214 Ill. 421, p. 453;
Chicago, Wilmington & Vermillion Coal Co. v. People, 114 Ill. App. 75.

Under this statute a charge that a conspiracy by the parties named was formed unlawfully, fraudulently, maliciously, wrongfully and wickedly, while not in the language of the statute, in effect charges the conspiracy to have been formed with the fraudulent or malicious intent wrongfully and wickedly to do an illegal act injurious to the public and is therefore sufficient.

Chicago, Wilmington & Vermillion Coal Co. v. People, 214 Ill. 421, p. 447;
Chicago, Wilmington & Vermillion Coal Co. v. People, 114 Ill. App. 75.

2. MINING CORPORATIONS—CLASSIFICATION.

The placing of corporations, including mining corporations, in a class by themselves and requiring them to file an anti-trust affidavit leaving individuals and partnerships liable to the penalties of the act provided for is not an illegal or arbitrary classification.

People v. Butler St. Foundry & Iron Co., 201 Ill. 236, p. 248.

The legislature has power to form classes for the purpose of police regulation if there is no arbitrary discrimination between persons or things in substantially the same situation.

People v. Butler St. Foundry & Iron Co., 201 Ill. 236, p. 256.

3. CONSTRUCTION AND VALIDITY OF STATUTE.

The act of June 11, 1891, was not repealed by the act of June 20, 1893, entitled, "An act to define trusts and conspiracies against trade and declaring contracts in violation of the provisions of this act void and making certain acts in violation thereof misdemeanors," etc. (Laws 1893, p. 182.) This intention on the part of the legislature was evidenced by the fact that upon the day on which the latter act was passed the former act was amended. This intention was further evidenced by the fact that the act of 1891 was again amended in 1897.

People v. Butler St. Foundry & Iron Co., 201 Ill. 236, p. 257.

The amendment of 1897 does not in terms repeal section 1 of the act of 1891. If any part of the act of 1891 is repealed it must be a repeal by implication and because the amendment is in conflict with the original act or a part thereof. The act of 1891 as amended by the act of 1893 is not repealed by implication by any act of 1893 or by the act of 1897.

People v. Butler St. Foundry & Iron Co., 201 Ill. 236, p. 259.

The act of 1891, as amended by the act of 1893, was a valid statute. That act, as amended, and the act of 1897 are separate and distinct acts passed by different legislatures, and the subsequent unconstitutional act of 1897, which is without force, can have no effect to overthrow and render void the legal and constitutional expression of the legislature as manifested by the act of 1891 as amended in 1893.

People v. Butler St. Foundry & Iron Co., 201 Ill. 236, p. 258.

4. CONSTITUTIONALITY OF AMENDMENTS.

The amendatory act of 1897 is unconstitutional and void as being an unlawful discrimination in favor of the persons sought to be exempted by the amendment from the operation of the act of 1891.

People v. Butler St. Foundry and Iron Co., 201 Ill. 236, p. 253;

Chicago, Wilmington & Vermilion Coal Co. v. People, 214 Ill. 421, p. 454.

OWNING STOCK IN RAILROAD COMPANIES.

LAWS 1893, P. 165.

JUNE 21, 1893.

AN ACT to authorize mining or manufacturing companies to own and hold shares of the capital stock and to own and hold securities of railroad companies whose roads shall connect the different plants of such mining or manufacturing companies with each other, or with other railroads, or harbors.

SECTION 1. Be it enacted, etc.: That any corporation organized or to be organized under and by virtue of any law of this State, for mining or manufacturing purposes, be and the same is hereby authorized to own and hold shares of the capital stock and to own and hold securities of any railroad company now or hereafter to be organized under any law of this State, when any such railroad or railroads shall connect the different plants of such mining or manufacturing companies with each other or with other railroads or harbors: Provided, that said mining or manufacturing companies shall not be permitted to hold stock in more than one railroad connecting the same points.

AMENDATORY ACT, 1897.

LAWS 1897, P. 285.

JUNE 11, 1897.

AN ACT to authorize mining or manufacturing companies to own and hold shares of the capital stock, and to own and hold securities of railroad companies whose roads shall connect the different plants of such mining or manufacturing companies with each other or with other railroads or harbors.

SECTION 1. Be it enacted, etc.: That an act entitled "An act to authorize mining or manufacturing companies to own and hold shares of the capital stock, and to own and hold securities of railroad companies whose roads shall connect the different plants of such mining or manufacturing companies with each other or with other railroads or harbors," approved on the 21st day of June, 1893, and in force on the 1st day of July, 1893, be and the same is hereby amended so as to read as follows:

SECTION 1. That any corporation organized, or to be organized, under and by virtue of any law of this State for mining or manufacturing purposes be and the same is hereby authorized to own and hold shares of the capital stock and to own and hold securities of any railroad company or companies when such railroad or railroads shall connect the different plants of such mining or manufacturing companies with each other or with other railroads or harbors: Provided, that said mining or manufacturing companies shall not be permitted to hold stock in more than one railroad connecting the same points.

**MINING INVESTIGATING COMMISSION.
COMMISSION TO INVESTIGATE MINING.**

LAWS 1909, P. 55.

LAWS 1913, P. 43.

LAWS 1915, P. 30.

SEE PAGE 442.

JUNE 10, 1909.

JUNE 21, 1913.

JUNE 29, 1915.

AN ACT to establish the Mining Investigating [Investigation (1915)] Commission of the State of Illinois, and prescribing its powers and duties and making an appropriation therefor.

NOTE.—Changes made by the act of June 21, 1913, and the act of June 29, 1915, are shown in brackets.

SECTION 1. Be it enacted, etc.: That a commission be established to be known as the Mining Investigation Commission of the State of Illinois, consisting of three coal mine owners and three coal miners appointed by the Governor, together with three qualified men, no one of whom shall be identified or affiliated with the interests of either the mine owners or coal miners or dependent upon the patronage or good will of either, nor in political life, who shall be appointed by the Governor.

Each member of the said commission shall have equal authority, power and voting strength in considering and acting upon any matters which may be brought to the attention of the commission and on which the commission may act and the said commission shall have power and authority to investigate the methods and conditions of mining coal in the State of Illinois with special reference to the safety of human lives and property and the conservation of the coal deposits.

SEC. 2. In making any [an] investigation as contemplated in this Act, said commissioners shall have the power to issue subpoenas for the attendance of witnesses, which shall be under the seal of the commission and signed by the chairman or secretary of said commission.

In case any person shall willfully fail or refuse to obey such subpoena, it shall be the duty of the circuit court of any county, upon application of the said commissioners, to issue an attachment for such witness, and compel such witness to attend before the commissioners, and give his testimony upon such matters as shall be lawfully required by such commissioners; and the said court shall have the power to punish for contempt, as in other cases of refusal to obey the process and order of such court.

The fees of witnesses shall be the same as in [the] courts of record and shall be paid out of the appropriation hereinafter made.

And upon order duly entered of record by the said commission any one or more members of the said commission shall be empowered to take testimony touching the matters within the jurisdiction of the said commission and report the same to the said commission.

Said commission shall have power and are authorized to adopt a seal and to make such rules not inconsistent with or contrary to law for the government of proceedings before it, as it may deem proper and shall have the same power to enforce such rules and to preserve order and decorum in its presence as is vested by the common law or statute of this State in any court of general jurisdiction.

SEC. 3. Said commission shall meet at the State Capitol building in Springfield, on the second Tuesday after notice of their appointment and shall immediately elect a chairman and secretary from among their number, one of whom

shall be a coal mine owner and the other a coal miner. Said commission shall cause a record to be kept of all its proceedings.

Five members of the said commission shall constitute a quorum for the transaction of business, but a less number than a quorum may adjourn the meetings of the commission from time to time.

Meetings of the said commission other than called meetings, as provided for herein, may be held at such times and places within the State of Illinois, as may be fixed by the said commission.

A meeting of the said commission shall be held upon the written request of any three members of the said commission signed by them and delivered to the secretary, who shall, upon receipt of such request, notify each member of said commission by mail of such meeting so to be held, and the time and place thereof. And no such meeting shall be held less than five days after the mailing of notice of the said meeting to the members of said commission by the secretary.

Such called meeting shall be held either in Springfield or Chicago.

SEC. 4. Said commission shall report to the Governor and to the General Assembly at its next regular session, submitting so far as they have unanimously agreed, a proposed [provision (1913) (1915)] revision of coal mining laws of the State, together with such other recommendations as to the commission shall seem fit and proper, relating to coal mining in the State of Illinois.

And where there is not unanimous agreement upon any recommendation there shall be submitted in like manner separate reports embodying the recommendations of any one or more members of the said commission, which said reports shall each set forth in detail the recommendation of the commissioner or commissioners signing said report and shall embody his or their respective reasons for such recommendation and his or their objections to the reports [report] of other members of the commission. Upon the filing of the above mentioned reports, recommendations and objections, the duties and functions of said commission shall cease. [The duties and functions of said commission shall cease and the terms of office of the respective commissioners shall terminate upon the adjournment of the Forty-ninth (1913) (Fiftieth) (1915) General Assembly.]

SEC. 5. The members of said commission who are coal mine owners and coal miners, as aforesaid, shall receive no compensation for their services. The remaining three members of the commission shall receive as compensation for their services the sum of \$10.00 per day for each day actually employed by them as such commissioners. All members of the said commission shall be reimbursed for their actual expenses incurred in and about the actual work of said commission.

Said commission may appoint a stenographer or clerk and such other employees as are necessary and shall fix their compensation and may incur such other expenses as are properly incidental to the work of the commission.

SEC. 6. The sum of twenty-five thousand dollars (\$25,000) [ten thousand dollars (\$10,000.00) (1913) (seven thousand dollars (\$7,000.00) (1915))] or as much thereof as may be necessary, is hereby appropriated for the postage, stationery, clerical and expert services, and incidental traveling expenses of the commission, and the per diem of members as herein authorized, and the Auditor of Public Accounts is hereby authorized to draw his warrant for the foregoing amount or any part thereof, in payment of any expenses, charges or disbursements authorized by this Act, on order of this commission, signed by its chairman, attested by its secretary, and approved by the Governor.

The State Board of Contracts is hereby authorized and directed to provide all necessary printing for the mining investigation [investigating] commission, and testimony taken by it shall be reported in full and may be published from time to time by the commission. See page 442.

MINING LEASES—RELEASE.

OIL LEASES—RELEASE.

LAWS 1907, P. 400.

MAY 27, 1907.

AN ACT for the purpose of compelling oil or gas leases, when forfeited, to be released of record and providing a penalty therefor.

SECTION 1. Be it enacted, etc.: When any lease on land heretofore or hereafter taken for the purpose of prospecting for oil or natural gas or operating oil or gas wells upon lands so leased, shall become forfeited by the terms of said lease or the acts of the lessee, it shall be the duty of the lessee, his, her or their successors or assigns within sixty days from the date this Act shall take effect, if such forfeiture take effect prior thereto and within sixty days from day of forfeiture of any and all other leases, to have such lease or leases released of record in the county where such land is situated, without any cost to the owner or owners of the land; and any failure so to do shall constitute a misdemeanor and shall subject the offender to a fine of not more than two hundred dollars.

SEC. 2. Whenever the lessee of any oil or natural gas lands or the person, firm, company or corporation, only holding or having control of any such lease shall allow the same to become forfeited, or by his, her or their acts shall forfeit the same, and shall refuse, fail or neglect to cause the same to be released of record, the lessor or owner of said lands, may begin a civil action to compel said party to release the same of record and upon judgment being rendered decreeing said lease forfeited and directing the release, the said lessee, or his assigns, shall be decreed to pay all costs by such action, including a reasonable attorney fee to be taxed as costs.

RELEASE BY HEIRS, REPRESENTATIVES, ETC.

LAWS 1913, P. 457.

JULY 12, 1913.

AN ACT for the purpose of requiring lessee, his, her or their heirs, representatives, successors or assigns to release of record coal and other mineral leases, when forfeited, and providing a penalty for failure, refusal or neglect so to do.

SECTION 1. Be it enacted, etc.: When any lease on land heretofore or hereafter taken for the purpose of prospecting for coal or other mineral, or for the purpose of mining the coal or other mineral from said land, so leased, shall become forfeited by the terms of said lease or the acts of said lessee, his, her, or their heirs, representatives, successors or assigns, it shall be the duty of said lessee, his, her or their heirs, representatives, successor or assigns, within sixty days from the time this Act shall take effect, if such forfeiture take effect prior thereto, and within sixty days from the date of forfeiture of any and all other leases, to have such lease or leases, released of record in the county where such land is situated, without any cost to the owner or owners of the land; and any failure so to do after notice and demand shall constitute a misdemeanor and shall subject the offender to a fine of not more than two hundred dollars.

SEC. 2. Whenever the lessee of any coal or other mineral lands, or the person, firm, company or corporation, owning, holding or having control of any such lease shall allow the same to be forfeited, or by his, her or their acts shall forfeit the same, and shall refuse, fail or neglect to cause the same to be released of record in the county where said lands are situated, the lessor or owner of said lands may begin and maintain a civil action to compel said party to release the same of record and upon judgment being rendered decreeing said lease forfeited and directing the release, the said lessee, or the person, firm, company or corporation owning, holding or controlling said lease, shall be decreed to pay all costs accruing by said action, including a reasonable attorney fee to be taxed as cost.

NOTE.—Became law without Governor's approval July 1, 1913.

MINING OPERATIONS.

MINING REGULATIONS—ORIGINAL ACT 1872.

LAWS 1871-72, P. 568.

MARCH 27, 1872.

AN ACT providing for the Health and Safety of Persons employed in Coal Mines.
(Repealed. See page 146.)

SECTION 1. Be it enacted, etc.: That the owner or agent of each and every coal mine or colliery in this state, employing ten men or more, shall make or cause to be made, at the discretion of the inspector, or person acting in that capacity, an accurate map or plan of the workings of such coal mine or colliery, and of each and every vein thereof, showing the general inclination of the strata, together with any material deflections in the said workings, and the boundary lines of said coal mine or colliery, and deposit a true copy of said map or plan with the inspector of coal mines, to be filed in his office, and another true copy of said map or plan with the recorder of the county in which said coal mine or colliery is situated, to be filed in his office, both of which said copies shall be deposited as aforesaid, within three months from the day when this act shall go into effect; and the original, or a copy of such map or plan, shall also be kept for inspection at the office of such coal mine or colliery; and during the month of January of each and every year, after this act shall go into effect, the said owner or agent shall furnish the inspector and recorder, as aforesaid, with a statement and a further map or plan of the progress of the workings of such coal mine or colliery continued from the last report to the end of the December month just preceding; and the inspector shall correct his map or plan of said workings in accordance with the statement and map or plan thus furnished; and when any coal mine or colliery is worked out or abandoned, that fact shall be reported to the inspector, and the map or plan of such coal mine or colliery in the office of said inspector shall be carefully corrected and verified.

SEC. 2. Whenever the owner or agent of any coal mine or colliery shall neglect or refuse to furnish to said inspector and recorder, as aforesaid, with the statement, the map or plan, or addition thereto, as provided in the first section of this act, at the times and in the manner therein provided, the said inspector is hereby authorized to cause an accurate map or plan of the workings of such coal mine or colliery, to be made at the expense of the said owner or agent, and the cost thereof may be recovered by law from said owner or agent, in the same manner as other debts, by suit in the name of the inspector and for his use.

SEC. 3. In all coal mines or collieries that are, or have been in operation prior to the first day of July, in the year of our Lord 1872, and which are worked by or through a shaft, slope or drift, and in which more than fifteen miners are employed, if there is not already an escapement shaft to each and every said coal mine or colliery, or a communication between each and every said coal mine or colliery and some other contiguous mine, there shall be an escapement shaft, making at least two distinct means of ingress and egress for all persons employed or permitted to work in such coal mine or colliery. Such escapement shaft, or other communication with a contiguous mine as aforesaid shall be constructed in connection with every vein or stratum of coal worked in such coal

mines or collieries, and the time to be allowed for such construction shall be one year for each one hundred feet in depth of such escapement shaft so to be constructed, or fractional part thereof. And each and every such escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the miners, such distance to be left to the discretion of the inspector or person acting in that capacity. And in all coal mines or collieries that shall go into operation for the first time after the first day of July, in the year of our Lord 1872, such escapement shaft or other communication with a contiguous mine, as aforesaid, to be made for the purpose aforesaid, shall be constructed within one year after such mine shall have been put into operation, when the depth of such coal mine or colliery does not exceed one hundred feet. And in all coal mines that are of a greater depth than one hundred feet there shall be allowed one year within which to construct each hundred feet or fractional part thereof of such escapement shaft. And it shall not be lawful for the owner or agent of any such coal mine or colliery, as aforesaid, to employ any person to work therein, or to permit any person to go therein for the purpose of working, unless said owner or agent shall have first complied with the requirements of this section. And the term "owner" used in this act shall mean the immediate proprietor, lessee or occupier of any coal mine or colliery, or any part thereof; and the term "agent" shall mean any person having, on behalf of the owner, as aforesaid, the care and management of any coal mine or colliery, or any part thereof. (Amended. See page 133.)

SEC. 4. The owner or agent of each and every coal mine or colliery shall provide therefor an adequate amount of ventilation, by forcing, when practicable, the circulation of pure air through to the face of each and every working place in every such coal mine or colliery, so that every such coal mine or colliery shall be fit for men to work therein, and free from standing gas and from danger to health and life by reason of any noxious gas. The ventilation required by this section may be produced by any suitable appliances, but in case a furnace shall be used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works, by lining the up-cast with incombustible material for a sufficient distance up from the said furnace.

SEC. 5. The owner, agent or mining boss shall provide that bore holes shall be kept twenty feet in advance of the face of each and every working place—and, if necessary, on both sides—when driving towards an abandoned mine, or part of a mine, suspected to contain inflammable gases, or to be inundated with said furnace.

SEC. 6. The owner or agent of every coal mine or colliery, opened or operated by shaft or slope, shall provide a suitable means of signalling between the bottom and the top thereof, and shall also provide a safe means of hoisting or lowering persons at the mines, with a sufficient cover overhead on every box or carriage used for hoisting purposes, for the protection of persons so hoisted or lowered at the mines. And no young person under fourteen years of age, or female of any age, shall be permitted to enter any mine to work therein; proof of age to be made by sworn certificate or otherwise, before such young person shall be employed to work in such mine. The neglect or refusal of any person or party to perform the duties provided for and required to be performed by sections 4, 5 and 6 of this act, by the parties therein required to perform the same, shall be taken and deemed to be a misdemeanor committed by them or any or either of them, and upon conviction thereof they, or any or either of them, shall be punished by imprisonment or fine, at the discretion of the court trying the same. (Amended. See pages 132, 134.)

SEC. 7. No person shall, knowingly, be employed as engineer, or to take charge of any machinery or appliance whereby men are lowered into or hoisted out of any mine, but an experienced, competent and sober person; and no person shall ride upon a loaded wagon or cage used for hoisting purposes in any shaft or slope; nor shall any coal be hoisted out of any coal mine or colliery while persons are ascending out of or descending into any such coal mine or colliery. Any person violating the provisions of this section shall be held and deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by fine or imprisonment, at the discretion of the court trying the same. (Amended. See page 134.)

SEC. 8. All boilers used in generating steam in and about coal mines and collieries shall be kept in good order, and the owner or agent, as aforesaid, shall have said boilers examined and inspected by a competent boiler maker, or other well qualified person, as often as once every six months, and oftener if needed, and the result of every such examination shall be certified in writing to the mining inspector; and the top of each shaft shall also be securely fenced by vertical or flat gates, properly covering and protecting the area of such shaft; and the entrance of every abandoned slope and air, or other shaft, shall be securely fenced off; and every steam boiler shall be provided with a proper steam gauge, water gauge and safety-valve; and all underground self-acting or engine-planes or gangways, on which coal cars are drawn and persons travel, shall be provided with some proper means of signaling between the stopping places and the ends of said planes or gangways; and sufficient places of refuge at the sides of such planes or gangways shall be provided at intervals of not more than twenty feet apart.

SEC. 9. Whenever loss of life or serious personal injury shall occur, by reason of any explosion or of any accident whatsoever in or about any coal mine or colliery, it shall be the duty of the party having charge of such coal mine or colliery to give notice thereof to the mine inspector, and if any person is killed thereby, to the coroner of the county also, and said inspector shall immediately go to the scene of the said accident, and make such suggestions and render such assistance as he may deem necessary for the safety of the men. And the inspector shall investigate and ascertain the cause of such explosion or accident, and make a record thereof, which he shall preserve with the other records of his office. And to enable him to make such investigations he shall have power to compel the attendance of witnesses and administer oaths or affirmations to them; and the costs of such investigations shall be paid by the county in which such accident has occurred, in the same manner as costs of coroner's inquests are now paid. And the failure of the person in charge of the coal mine or colliery in which any such accident may have occurred, to give notice to the inspector or coroner, as provided for in this section, shall subject such person to a fine of not less than twenty-five dollars nor more than one hundred dollars, to be sued for in the name and for the use of the county in which any such accident may have occurred. (Amended. See page 135.)

SEC. 10. In all cases in which punishment is provided by fine or imprisonment under this act, for a breach of any of its provisions, the fine shall not be less than ten dollars nor more than one hundred dollars, or the imprisonment not less than ten days nor more than six months, or both, at the discretion of the court, except as specially provided in section 9 of this act.

SEC. 11. The county surveyors are hereby constituted ex officio inspectors of mines within their respective counties; and it shall be their duty respectively to call to their aid some reputable, practical miner. Said inspector, and any miner so called to their aid, before entering upon their duties, shall be sworn

to faithfully discharge the duties imposed upon them by law. Said inspector and said miner shall receive such compensation for their time actually employed, to be verified by their respective affidavits, as shall be fixed by the county board, not exceeding five dollars per day each, to be paid out of the county treasury. "For one inspection every year, but in all cases where, on inspection, the provisions of this act shall appear not to have been complied with in operating a mine, the owner or operator of such mine shall pay the expenses thereof, to be recovered, if necessary, as provided in section two (2) of this act. (Amended. See page 135.)

SEC. 12. The inspector provided for under this act shall see that every necessary precaution is taken to ensure the health and safety of the workmen therein employed, that the provisions and requirements of this act be faithfully observed and obeyed, and the penalties of the law enforced against all who willfully disobey its requirements. He shall also collect and tabulate the following facts, that is to say: The number of acres of workable coal lands in his county; the number and thickness of the coal beds, and their respective depths below the surface; how they are mined, whether by shaft, slope or drift; the number of mines in operation, the number of men employed therein, and the aggregate yearly production in tons; together with an estimate of the amount of capital employed in coal mining in his county, and any other information relative to coal mining that he may deem necessary; all of which facts, so tabulated, together with a statement of the condition of the mines as to safety and ventilation, and the general result of his examination into the causes of all accidents in and about the coal mines and collieries of his county, he shall fully set forth in an annual report to the governor, with his recommendations as to such other legislation on this subject as may be proper. He shall also furnish such information as he may have obtained on this subject, when called for by the state geologist.

SEC. 13. It shall be lawful for the inspector provided for in this act to enter, examine and inspect any and all coal mines or collieries, and the works and machinery belonging thereto, at all reasonable times by day or night, but so as not to hinder or obstruct the necessary working of such coal mines or collieries; and the owner or agent of every such coal mine or colliery is hereby required to furnish all necessary facilities for such entry, examination and inspection; and if the said owner or agent, as aforesaid, shall refuse to permit such inspection, or to furnish the necessary facilities therefor, the inspector may file his affidavit, setting forth such refusal, with the judge of the circuit in which said mine may be situated either in term time or in vacation, or in the absence of the judge, with the master in chancery for the county in which said mine may be situate, and obtain an order on such owner or agent so refusing as aforesaid, commanding him to permit and furnish such necessary facilities for the inspection of such coal mine or colliery, or be adjudged to stand in contempt of court, and punished accordingly; and if the said inspector shall, after an examination of any coal mine or colliery and the works and machinery pertaining thereto, find the same to be worked contrary to the provisions of this act, or unsafe for the workmen therein employed, said inspector may, through the state's attorney of his county, acting in the name and on behalf of the state, proceed against the owner or agent of any such coal mine or colliery by injunction, without bond, after giving at least two days notice to such owner or agent, and the said owner or agent shall have the right to appear before the judge or master to whom the application is made, who shall hear the same, and affidavits in support thereof as well as affidavits in opposition, and if sufficient cause appear, the court or judge in vacation may prohibit the further

working of any such coal mine or colliery in which persons may be unsafely employed, contrary to the provisions of this act, until the same shall have been made safe and the requirements of this act shall have been complied with; and the court shall award such costs in the matter of the said injunction as may be just; but any such proceedings, so commenced, shall be without prejudice to any other remedy permitted by law for enforcing the provisions of this act.

SEC. 14. For any injury to person or property occasioned by any wilful violations of this act, or wilful failure to comply with any of its provisions, a right of action shall accrue to the party injured for any direct damages sustained thereby; and in case of loss of life by reason of such wilful violation or wilful failure, as aforesaid, a right of action shall accrue to the widow of the person so killed, or his lineal heirs or adopted children, or to any other person or persons who were, before such loss of life, dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives.

SEC. 15. Any miner, workman or other person who shall knowingly injure any water-gauge, barometer, air-course or brattice, or shall obstruct or throw open any air-ways, or carry lighted lamps or matches into places that are worked by the light of safety-lamps, or shall handle or disturb any part of the machinery of the hoisting engine, or open a door in the mine and not have the same closed again, whereby danger is produced either to the mine or those at work therein; or who shall enter into any part of the mine against caution; or who shall disobey any order given in pursuance of this act; or who shall do any wilful act whereby the lives and health of persons working in the mine, or the security of the mine or mines, or the machinery thereof, is endangered, shall be deemed guilty of a misdemeanor, and upon conviction shall be punished by fine or imprisonment, at the discretion of the court.

FIRST AMENDATORY ACT, 1873.

LAWS 1873, P. 126.

APRIL 24, 1873.

AN ACT to amend section 6 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved March 27, 1872.

SECTION 1. Be it enacted by the People of the State of Illinois, represented in the General Assembly, That section 6 of said act be amended so as to read as follows: The owner or agent of every coal mine or colliery, opened or operated by shaft or slope, shall provide a suitable means of signaling between the bottom and top thereof, and shall also provide a safe means of hoisting and lowering persons at the mines with a sufficient cover over head, on every box or carriage used for hoisting purposes, for the protection of persons so hoisted or lowered at the mines. And no young person, under twelve years of age, or woman, or girl of any age, shall be permitted to enter any mine to work therein. The neglect or refusal of any person or party to perform the duties provided for and required to be performed by sections 4, 5 and 6 of this act, by the parties therein required to perform the same, shall be taken and deemed to be a misdemeanor committed by them, or any or either of them, and upon conviction thereof, they, or any or either of them, shall be punished by imprisonment or fine, at the discretion of the court trying the same; subject, however, to the limitations as provided by section 10 of said act.

SIGNALS—EMPLOYMENT OF CHILDREN.

SECOND AMENDATORY ACT, 1873.

**LAWS 1873-74, P. 132.
LAWS 1873, P. 119.**

**APRIL 24, 1873.
APRIL 24, 1873.**

AN ACT to amend section 6 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved March 27, 1872.

SECTION 1. Be it enacted, etc.: That section 6 of said act be amended so as to read as follows:

The owner or agent of every coal mine or colliery, opened or operated by shaft or slope, shall provide a suitable means of signaling between the bottom and top thereof, and shall also provide a safe means of hoisting and lowering persons at the mines, with a sufficient cover over head, on every box or carriage used for hoisting purposes, for the protection of persons so hoisted or lowered at the mines. And no young person, under twelve years of age, or woman, or girl of any age, shall be permitted to enter any mine to work therein. The neglect or refusal of any person or party to perform the duties provided for and required to be performed by sections 4, 5 and 6 of this act, by the parties therein required to perform the same, shall be taken and deemed to be a misdemeanor committed by them, or any or either of them, and upon conviction thereof, they, or any or either of them, shall be punished by imprisonment or fine, at the discretion of the court trying the same; subject, however, to the limitations as provided by section 10 of said act.

NOTE.—The original section 6 has heretofore been amended.

THIRD AMENDATORY ACT, 1877.

LAWS 1877, P. 139.

MAY 23, 1877.

AN ACT To amend sections 3, 6, 7, 9, and 11 of an act entitled, "An act providing for the health and safety of persons employed in coal mines," approved March 27, 1872. Approved May 23, 1877. In force July 1, 1877.

SECTION 1. Be it enacted by the people of the State of Illinois, represented in the General Assembly, That sections 3, 6, 7, 9, and 11 of an act entitled "An act providing for the safety of persons employed in coal mines," approved March 27, 1872, be, and the same are hereby, amended so as (to) read as follows:

SEC. 3. In all coal mines or collieries that are, or have been in operation prior to the first day of July, in the year of our Lord, 1877, and which are worked by or through a shaft, slope, or drift, and in which more than ten miners are employed in each twenty-four hours, if there is not already an escapement shaft to each and every said coal mine or colliery, or a communication between each and every coal mine or colliery, and some other contiguous mine, then there shall be an escapement shaft or other communication, such as shall be approved by the mine inspector, making at least two distinct means of ingress and egress for all persons employed or permitted to work in such coal mine or colliery. Such escapement shaft or other communication with a contiguous mine as aforesaid, shall be constructed in connection with every vein or stratum of coal worked in such coal mine or colliery; and the time to be allowed for such construction shall be one year, when such mine is under 100 feet in depth, two years when such mine is over 100 feet in depth, and under 300 feet, and three years when it is over 300 feet, and under 400 feet, and four years, when it is over 400 feet in depth, from the time this act goes into

effect: Provided, This section shall not be so construed as to extend the time now allowed by law proving escapement shafts, or other communications. And in all cases where the working face of one mine has been driven up to, or into the workings of another mine the respective owners of such mine, while operating the same, shall keep open a roadway at least two and one-half feet high and four feet wide, thereby forming a communication as contemplated in this act; and for a failure to do so shall be subject to the penalty provided for in section ten of this act, for each and every day such roadway is unnecessarily closed. Each and every such escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the men employed in such mines or collieries; such distance to be left to the discretion of the mine inspector or person acting in that capacity. And in all coal mines or collieries that shall go into operation for the first time after the first day of July, A. D. 1887, such escapement or other communication with a contiguous mine as aforesaid, shall be constructed within one year after such mine shall have been put into operation. And it shall not be lawful for the owner or agent of any such coal mine or colliery, as aforesaid, to employ any person to work therein or permit any person to go therein, for the purpose of working, unless said owner or agent shall have first complied with the requirements of this section. And the term "owner" used in this act, shall mean the immediate proprietor, lessee or occupant of any coal mine or colliery, or any part thereof; and the term "agent" shall mean any person having, on behalf of the owner, the care or management of any coal mine or colliery, or any part thereof.

SEC. 6. The owner or agent of every coal mine or colliery, operated by shaft, shall provide suitable means of signaling between the bottom and top thereof, and shall also provide safe means of hoisting and lowering persons in a cage covered with boiler iron, so as to keep safe, as far as possible, persons ascending out of and descending into such shaft; and such cage shall be furnished with guides to conduct it on slides through such shaft, with a sufficient break on the drum to prevent accident in case of the giving out or breaking of the machinery, and whenever practicable such cage shall be furnished with springs or catches, intended and provided, as far as possible, to prevent the consequences of cable breaking, loosing or disconnecting of machinery. And no person under the age of twelve years, or female of any age, shall be permitted to enter any mine to work therein; the neglect or refusal of any party or person to perform the duties provided for and required to be performed by sections 4, 5, and 6 of this act, by the parties therein required to perform the same, shall be taken and deemed guilty of a misdemeanor, committed by them, or any or either of them, and shall be punished by imprisonment or fine at the discretion of the court trying the same, subject, however to the limitations as provided by section 10 of this act.

NOTE.—This is the third amendment of the original section 6.

SEC. 7. No person shall, knowingly, be employed as engineer or to take charge of any machinery or appliances whereby men are lowered into or hoisted out of any mine, but an experienced, competent and sober person; and no person shall ride upon a loaded wagon or cage used for hoisting purposes in any shaft or slope; nor shall any coal be hoisted out of any coal mine or colliery while persons are ascending out of or descending into any such coal mine or colliery; and the number of persons to ascend out of or descend into any coal mine or colliery on one cage shall be determined by the inspector. The maximum number so fixed shall not be less than six nor more than fifteen, nor shall they be lowered nor hoisted more rapidly than 600 feet to the

minute. Any person violating the provisions of this section shall be held and deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by fine or imprisonment, at the discretion of the court trying the same.

SEC. 9. Whenever loss of life, or serious personal injury shall occur by reason of any explosion, or of any accident whatsoever, in or about any coal mine or colliery, it shall be the duty of the person having charge of such coal mine or colliery to report the facts thereof without delay to the mine inspector of the county in which said coal mine or colliery is situated; and if any person is killed thereby to notify the coroner of the county also, or in his absence or inability to act, any justice of the peace of said county; and the said inspector shall, if he deem it necessary from the facts reported, immediately go to the scene of said accident, and make such suggestions and render such assistance as he may deem necessary for the safety of the men. And the inspector shall investigate and ascertain the cause of such explosion or accident, and make a report thereof, which he shall preserve with the other records of his office; and to enable him to make such investigations, he shall have power to compel the attendance of witnesses, and administer oaths or affirmations to them; and the cost of such investigation shall be paid by the county in which such accident has occurred, in the same manner as costs of coroners' inquests are now paid. And the failure of the person in charge of the coal mine or colliery in which any such accident may have occurred, to give notice to the inspector or coroner, as provided for in this section, shall subject such person to a fine of not less than twenty-five dollars nor more than one hundred dollars, to be recovered in the name of the People of the State of Illinois, before any justice of the peace of such county, and such fine when collected shall be paid into the county treasury for the use of the county in which any such accident may have occurred.

SEC. 11. The county boards in each county of this State in which mining is now, or may hereafter be carried on, are hereby authorized, and it is made their duty, to appoint one inspector of mines, at its September meeting, who shall have been a resident of the county, for which he is appointed, for one year previous to his appointment. He shall be required to enter into a bond to the county board of said county, for a sum to be fixed by said county board, conditioned upon the due and faithful discharge of his duties; said bond to be accompanied with good and sufficient security to be approved by said county board. He shall also take an oath of office as prescribed by the constitution, and he shall be required to furnish satisfactory evidence to said board that he has had sufficient practical experience in and around mines to enable him to discharge the duty of mine inspector intelligently, and to see that the provisions of this act are faithfully complied with. He shall not be interested as owner or stockholder in any mine or mines during his term of office. His term of office shall be one year, but he may be reappointed as often as the county board thinks proper. The county board of each county shall fix the number of days to be employed by the county inspector in inspecting the different mines of his county, and enter the same upon the records of said board. He shall receive such compensation for his time actually employed in the performance of the duties of his office, to be verified by his affidavit, as shall be fixed by the county board, to be not less than three dollars nor more than five dollars, per day, to be paid out of the county treasury. But in all cases where, on inspection, he finds the provisions of this act, or any of them, not complied with in operating any mine, it is made his duty to demand, and if necessary, compel by law, the collection from the owners or operators of such mine, of all expenses of said inspection, as provided in section two of this act.

SEC. 2. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

ANNOTATIONS.

1. INSPECTION BY SURVEYOR.
2. NOTICE OF ACCIDENTS—PERSON IN CHARGE.
3. OWNER OF MINE—LIABILITY FOR PENALTY.
4. ESCAPEMENT SHAFT—TIME FOR CONSTRUCTION.
5. SHAFTS—ENTRANCE PROTECTED.
6. SHAFT—LIGHTING—PROOF.
7. LIABILITY OF OPERATION FOR MISTAKES OF INSPECTOR.
8. APPLICATION AND PROTECTION OF STATUTE—WORKMAN.
9. FAILURE TO COMPLY WITH STATUTE—PROXIMATE CAUSE.
10. WILLFUL VIOLATION OF STATUTE.
11. UNDERGROUND WORKINGS—APPLICATION OF STATUTE.
12. CONTRIBUTORY NEGLIGENCE—KNOWLEDGE OF DANGER.
13. ACTION FOR DEATH—WHO MAY SUE—PLEADING.
14. DEATH OF MINER—ACTION BY WIDOW.
15. REPEAL.

1. INSPECTION BY SURVEYOR.

Section 11 of this statute provides for an inspection of mines by the county surveyor of each county, thereby making such surveyors ex officio inspectors of mines within their respective counties.

Sholl v. People, 93 Ill. 129, p. 130.

2. NOTICE OF ACCIDENTS—PERSON IN CHARGE.

Section 9 requires the person having charge of a mine, immediately upon the happening of an accident, to report the facts of the accident without delay to the mine inspector, and if a miner is killed to notify the coroner also. The duty of taking immediate action upon the occurrence of an accident is not imposed upon the "owner or agent" of a mine, as the owner might not be present, and for this reason the duty is imposed upon the "person in charge" of the mine, the person upon the ground at the time, who would have immediate knowledge of the accident and would be able to make immediate report and give the immediate notice required by the statute.

Sholl v. People, 93 Ill. 129, p. 130.

3. OWNER OF MINE—LIABILITY FOR PENALTY.

The penalty provided by section 9 of this statute can not be imposed upon the owner of a mine who at the time of an accident was not personally present and was not in charge of the mine and who had not been present at the mine for a period of six months prior to the accident.

Sholl v. People, 93 Ill. 129, p. 130.

The penalty imposed by section 9 of the amendatory act of 1877 (Laws of 1877, p. 141) is upon the "person in charge," of the mines and makes him personally liable for failure to give the notice required by the statute. That the section does not refer to the "owner or agent" is evident from the fact that the preceding sections use the words "owner or agent," but in section 9 these words are dropped and the words "person in charge" substituted, showing an intention on the part of the legislature to impose the penalty on the person in charge whether he is the agent or the owner.

Sholl v. People, 93 Illinois 129, p. 132.

4. ESCAPEMENT SHAFT—TIME FOR CONSTRUCTION.

A mine operator operating a coal mine to the depth of 330 feet prior to July 1, 1877, and in which more than 10 men were employed, and operating the same with one escapement shaft, is liable to the penalty imposed by that act if he failed to have constructed a completed and second escapement shaft on or before July 1, 1880; and the act of 1879 did not repeal the act of 1877 in this respect and did not extend the time for the construction of the second escapement shaft.

Hamilton v. State, 102 Ill. 367, p. 368.

The act of 1877 provides that in a mine of less than 100 feet deep the operator shall have two years, and if the mine is 100 feet and less than 300 feet he shall have three years, in which to construct the additional escapement shaft. The act went into force July 1, 1877, and accordingly the time for the construction of an additional escapement shaft in a mine over 300 feet deep would expire July 1, 1880.

Hamilton v. State, 102 Ill. 367, p. 368.

5. SHAFTS—ENTRANCE PROTECTED.

It is the duty of a mine operator under section 8 of this statute to protect the entrance to the shaft and in an action under section 14 to recover damages for injuries for an alleged failure to comply with the statute it is proper to show the entire condition at the entrance of the shaft.

Odin Coal Co. v. Denman, 84 Ill. App. 190, p. 196.

6. SHAFT—LIGHTING—PROOF.

Section 6 of this act requires a coal mine operator to make suitable provision for furnishing sufficient light at the top of the shaft, and in an action by an injured miner for damages for an alleged violation of the statute in failing to furnish sufficient light it is proper to show what means were employed to that end and how such means met the requirements.

Odin Coal Co. v. Denman, 84 Ill. App. 190, p. 196.

7. LIABILITY OF OPERATOR FOR MISTAKES OF INSPECTOR.

The statute does not provide how nor to what extent the examination should be made; but if a mine operator employs an examiner holding a certificate authorizing him to act as such, and such examiner makes an examination at the time required, this constitutes a compliance so far as the operator is concerned. A mere mistake of the examiner or a failure on his part to detect a defective place in the roof does not constitute a willful neglect of the mine operator within the meaning of this statute.

Kellyville Coal Co. v. Hill, 87 Ill. App. 424, p. 426.

See Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 19.

8. APPLICATION AND PROTECTION OF STATUTE—WORKMAN.

A person working in a coal mine must be regarded as a "workman" within the meaning of the statute when he is engaged in performing in the mine that character of labor which exposes him to the perils the statutes were designed to protect him against.

Mount Olive & Stauton Coal Co. v. Herbeck, 190 Ill. 39, p. 41;

Mount Olive & Stauton Coal Co. v. Herbeck, 92 Ill. App. 441;

Mount Olive & Stauton Coal Co. v. Rademacher, 190 Ill. 538, p. 543;

Kellyville Coal Co. v. Yehnka, 94 Ill. App. 74, p. 81.

9. FAILURE TO COMPLY WITH STATUTE—PROXIMATE CAUSE.

The object to be obtained by this statute was to prevent injuries to persons so employed in mining operations that the slightest degree of negligence might not prove fatal; and in a case where it is shown conclusively that if the mining company had complied with the provisions of the statute the accident would not have happened notwithstanding the manner in which the miner did his work, the mining company is liable in damages for an injury or death of a miner. Under such circumstances the injury was not occasioned by the negligence either of the miner or of a fellow servant, but was caused by the failure of the mine operator to comply with the provisions of the law.

Bartlett Coal & Min. Co. v. Roach, 68 Ill. 174, p. 175;
Wesley City Coal Co. v. Healer, 84 Ill. 126, p. 128;
Catlett v. Young, 143 Ill. 74, p. 80;
Eldorado Coal & Coke Co. v. Swan, 227 Ill. 586, p. 591.
 See *Brunnworth v. Kerens Coal Co.*, 260 Ill. 202, p. 218;
Coal Run Coal Co. v. Coughlin, 19 Ill. App. 412, p. 415.

A mining company that failed for more than two years to comply with this statute in the matter of providing at least two distinct means of ingress and egress for the miners is liable for the death of a miner caused by falling down a shaft extending from the mine in which he worked to a mine below while attempting to escape from the mine on an alarm of fire, though the fire was purely accidental and there was, in fact, no real danger from the fire, as in such case the violation of the statute must be regarded as the proximate cause of the miner's death.

Wesley City Coal Co. v. Healer, 84 Ill. 126, p. 129.
 See *Loescher v. Consolidated Coal Co.*, 259 Ill. 126, p. 129.

Section 8 of this act imposes upon all coal companies the obligation to erect gates at the top of the shaft and to use reasonable care to keep them safely closed at all times when it is not necessary to open them for use, and a failure to do this, and in consequence there is injury to an employee, the operator is liable under the statute and the law of fellow servants does not apply.

Coal Run Coal Co. v. Coughlin, 19 Ill. App. 412, p. 416.

10. WILFUL VIOLATION OF STATUTE.

The word wilful used in section 14 means a violation of the act or failure to comply with any of its provisions committed knowingly and deliberately.

Himrod Coal Co. v. Schroath, 91 Ill. App. 234, p. 237;
Odin Coal Co. v. Denman, 185 Ill. 413.
 See *Catlett v. Young*, 143 Ill., p. 74.

Section 6 of this act requires coal mine operators to provide safe means of hoisting and lowering persons in their mines with a sufficient cover overhead on their box or carriage used for hoisting purposes for the protection of persons hoisted or lowered into the mines; and where a mine operator wilfully used an uncovered cage for hoisting and lowering miners into its mine, in violation of the statute, an action may be maintained for injuries resulting to a miner although the miner may not himself have been free from negligence.

Litchfield Coal Co. v. Taylor, 81 Ill. 590, p. 595;
Catlett v. Young, 143 Ill. 74, p. 80;
Coal Run Coal Co. v. Coughlin, 19 Ill. App. 412, p. 415.

The act of 1872 providing for the health and safety of persons employed in coal mines went into force on the 1st day of July of that year. In an action for the death of a miner that occurred on the 9th day of July, 1872, the question as to whether the mine operator had sufficient time in which by the

exercise of reasonable diligence to have complied with the provisions of the statute, was a question of fact. The mining company must have known when the act took effect and if not prepared to comply with its provisions it was its duty to suspend operations in its mines until the necessary preparations could be made, and a failure to do so must be regarded as wilful, especially where the company continued to operate its mine in defiance of the law.

Bartlett Coal & Min. Co. v. Roach, 68 Ill. 174, p. 175;

Odin Coal Co. v. Denman, 84 Ill. App. 180, p. 201.

A coal mine operator in good faith placed gates at the top of his mine shaft as required by the statute. But merely because the gate happened to be open, wilful negligence can not be imputed nor does it imply wilful disobedience of the statute, especially where the evidence shows that the gate was properly provided but by some mishap had been left open but not wilfully.

Coal Run Coal Co. v. Coughlin, 19 Ill. App. 412, p. 414.

11. UNDERGROUND WORKINGS—APPLICATION OF STATUTE.

Section 8 of the statute requiring that all underground self-acting or engine planes or gangways on which coal cars are drawn and persons travel, shall be provided with certain named safety appliances, applies to all underground, self-acting or engine planes, and also to all underground gangways on which coal cars are drawn and persons travel, whatever the motive power may be.

Sangamon Coal Min. Co. v. Wiggerhaus, 122 Ill. 279, p. 283.

12. CONTRIBUTORY NEGLIGENCE—KNOWLEDGE OF DANGER.

Under this statute contributory negligence is not a defense.

Catlett v. Young, 143 Ill. 74, p. 81.

See Catlett v. Young, 38 Ill. App. 198, p. 202.

In an action by a miner for damages for injuries caused by the failure of a coal mine operator to have the cage equipped as required by this statute, the knowledge only of the miner of the failure of the coal mine operator to have the mine provided with these protections will not defeat the action; and though the injured miner may not have been entirely free from fault the operator is liable if he was guilty of wilful violation of the statute.

Litchfield Coal Co. v. Taylor, 81 Ill. 590;

Bodell v. Brazil Block Coal Co., 25 Ind. App. 654, p. 658.

See Durant v. Lexington Coal Co., 97 Mo. 62.

13. ACTION FOR DEATH—WHO MAY SUE—PLEADING.

The right of action for the death of a miner is by this statute vested in the widow of the deceased, his lineal heirs, adopted children or other dependent persons; and an administrator of the deceased miner cannot maintain an action for damages.

Litchfield Coal Co. v. Taylor, 81 Ill. 590;

Maule Coal Co. v. Partenheimer, 155 Ind. 100, p. 108.

In an action by an administrator of a deceased miner against a coal mine operator for damages for the death of a miner, an averment that it was the duty of the mine operator to furnish props and prop the dirt or slate and other dangerous material that fell from the roof and caused the miner's death, does not show a violation of the statute and is not sufficient to charge negligence of the operator under common law rules.

Consolidated Coal Co. v. Yung, 24 Ill. App. 255, p. 256.

See Consolidated Coal Co. v. Scheller, 42 Ill. App. 619, p. 635, 638;

Consolidated Coal Co. v. Schieber, 65 Ill. App. 304, p. 309;

Consolidated Coal Co. v. Parson, 66 Ill. App. 434, p. 439.

14. DEATH OF MINER—ACTION BY WIDOW.

Under section 14 of this statute a widow is the proper person to bring an action for the death of her husband while working in a coal mine as she is expressly authorized by this section to bring the suit. This section in its relation to miners is special and must control as to all cases specially enumerated in the act itself, as against the general statute authorizing actions in the name of the personal representatives of a deceased.

Litchfield Coal Co. v. Taylor, 81 Ill. 590, p. 592.

See Struthers v. People, 116 Ill. App. 481, p. 486.

Where the operator of a coal mine before permitting any person to enter the mine causes it to be daily examined by a competent and duly authorized agent, who in good faith makes such examination to ascertain if there are any dangerous conditions thereof which render it unsafe for men to begin work, and upon such examination fails to find any such dangerous condition, and reports the mine to be in a safe condition when in fact it is not, the operator is not liable to the widow of a miner killed by reason of existing dangerous conditions, as section 14 only authorizes her to maintain an action where the act has been wilfully violated or its provisions wilfully not complied with. In such case it cannot be said that the operator had knowingly and deliberately failed to have the mine examined or had wilfully permitted the men to enter the mine before the same had been reported in a safe condition to begin work.

Himrod Coal Co. v. Schroath, 91 Ill. App. 234, p. 237.

15. REPEAL.

This act was repealed by an act of May 28, 1879 (Laws of 1879, p. 204), providing for the health and safety for persons employed in coal mines, except such parts as were expressly retained and kept in force by the proviso to section 3 of the act of 1879.

Hamilton v. State, 102 Ill. 367, p. 369.

MINING OPERATIONS.

FIRST GENERAL REVISION, 1879.

LAWS 1879, P. 204.

MAY 28, 1879.

AN ACT providing for the health and safety of persons employed in coal mines. Approved May 28, 1879. In force July 1, 1879.

SECTION 1. Be it enacted, etc.: That the owner or agent or operator of each and every coal mine in this State, employing ten men or more, shall make or cause to be made, at the discretion of the inspector, or person acting in that capacity, an accurate map or plan of the workings of such coal mine, and of each and every vein thereof, showing the general inclination of the strata, together with any material deflections in the said workings, and the boundary lines of said coal mine, and deposit a true copy of said map or plan with the inspector of coal mines, to be filed in his office, and another true copy of said map or plan with the recorder of the county in which said coal mine is situated, to be filed in his office, both of which said copies shall be deposited as aforesaid within three months from the day when this act shall go into effect; and the original or a copy of such map or plan, shall also be kept for inspection at the office of such coal mine; and during the month of January of each and every year after this act shall go into effect, the said owner, agent, or operator shall furnish the inspector and recorder, as aforesaid, with a statement and a further map or plan of the progress of the workings of such coal mine, continued from the last report to the end of the December month just preceding; and the inspector shall correct his map or plan of said workings in accordance with the statement and map or plan thus furnished; and when any coal mine is worked out or abandoned, that fact shall be reported to the inspector, and the map or plan of such coal mine in the office of said inspector shall be carefully corrected and verified. (Amended. See following act, page 146.)

SEC. 2. Whenever the owner, agent or operator of any coal mine shall neglect or refuse to furnish the said inspector and recorder, as aforesaid, with the statement, the map or plan, or addition thereto, as provided in the first section of this act, at the times and in the manner therein provided, the said inspector is hereby authorized to cause an accurate map or plan of the workings of such coal mine to be made at the expense of said owner, agent or operator, and the cost thereof may be recovered by law from said owner, agent or operator, in the same manner as other debts, by suit in the name of the inspector and for his use.

SEC. 3. In all coal mines that are, or have been in operation prior to the first day of July in the year of our Lord 1879, and which are worked by or through a shaft, slope or drift, and in which more than ten miners are employed in each twenty-four hours, if there is not already an escapement shaft to each and every said coal mine, or communication between each and every coal mine, and some other contiguous mine, then there shall be an escapement shaft for other communication, such as shall be approved by the mine inspector, making at least two distinct means of ingress and egress for all persons employed or permitted to work in such coal mine. Such escapement shaft or other communication with a contiguous mine as aforesaid, shall be constructed in connection

with every vein or stratum of coal worked in such coal mine; and the time to be allowed for such construction shall be one year when such mine is under 100 feet in depth; two years when such mine is over one hundred (100) feet in depth and under three (300) hundred feet, and three years, when it is over three hundred (300) feet and under four hundred (400) feet, and four years when it is over four hundred feet in depth, and five years for all mines over five hundred (500) feet, from the time this act goes into effect; and in all cases where the working force of one mine has been driven up to or into the workings of another mine, the respective owners of such mine, while operating the same, shall keep open a roadway at least two and one-half feet high and four feet wide, thereby forming a communication as contemplated in this act; and for a failure to do so shall be subject to the penalty provided for in section 10 of this act, for each and every day such roadway is unnecessarily closed, each and every such escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the men employed in such mines; such distance to be left to the discretion of the mine inspector or person acting in that capacity, and in all coal mines that shall go into operation for the first time after the first day of January, A. D. 1880, such an escapement or other communication with a contiguous mine as aforesaid, shall be constructed within one year after such mine shall have been put into operation. And it shall not be lawful for the owner, agent or operator of any such coal mine as aforesaid to employ any person to work therein, or permit any person to go therein for the purpose of working, except such persons as may be necessary to construct such an escapement shaft, unless the requirements of this section shall have first been complied with, and the term owner used in this act shall mean the immediate proprietor, lessee or occupant of any coal mine or any part thereof, and the term agent shall mean any person having on behalf of the owner the care or management of any coal mine or any part thereof: Provided,—nothing in this section shall be construed to extend the time allowed by law for constructing the escapement shafts. (Amended. See pages 147, 152, 155.

SEC. 4. The owner, agent or operator, of every coal mine, whether operated by shaft, slope or drift, shall provide and maintain for every such mine a sufficient amount of ventilation, to be determined by the inspector at the rate of one hundred cubic feet of air per man per minute, measured at the foot of the down-cast, which shall be forced and circulated to the face of every working place throughout the mine, so that said mine shall be free from standing gas of whatsoever kind; and in all mines where fire damp is generated every working place where such fire damp is known to exist shall be examined every morning with a safety lamp by a competent person, before any other persons are allowed to enter. The ventilation required by this section may be produced by any suitable appliances, but in case a furnace shall be used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works by lining the up-cast with incombustible material for a sufficient distance up from said furnace. (Amended. See pages 150, 152.

SEC. 5. The owner, agent or operator shall provide that bore holes shall be kept twenty feet in advance of the face of each and every working place, and if necessary, on both sides, when driving towards an abandoned mine or part of a mine suspected to contain inflammable [inflammable] gases, or to be inundated with water.

SEC. 6. The owner, agent or operator of every coal mine operated by shaft shall provide suitable means of signaling between the bottom and top thereof, and shall also provide a safe means of hoisting and lowering persons in a cage covered with boiler iron, so as to keep safe, as far as possible, persons descending into and ascending out of such shaft; and such cage shall be furnished with

guides to conduct it on slides through such shaft, with a sufficient brake on every drum to prevent accident in case of the giving out or breaking of the machinery; and such cage shall be furnished with spring catches intended and provided, as far as possible to prevent the consequences of cable breaking or the loosening or disconnecting of the machinery; and no props or rails shall be lowered in a cage while men are descending into or ascending out of said mine:—Provided, that the provisions of this section in relation to covering cages with boiler iron, shall not apply to coal mines less than one hundred feet in depth, where the coal is raised by horse power. No person under the age of twelve years, or females of any age, shall be permitted to enter any mine to work therein, nor shall any boy under the age of fourteen, unless he can read and write, be allowed to work in any mine, any party or person neglecting or refusing to perform the duties required to be performed by sections 4, 5, 6, 7, and 8, shall be deemed guilty of a misdemeanor, and punished by fine in the discretion of the court trying the same, subject, however to the limitations as provided by section 10 of this act. (Amended. See page 147.)

SEC. 7. No owner, agent or operator of any coal mine, operated by shaft or slope, shall place in charge of any engine, whereby men are lowered into or hoisted out of the mines, any but an experienced, competent and sober person not under the age of 18 years; and no person shall ride upon a loaded cage or wagon used for hoisting purposes in any shaft or slope, and in no case shall more than twelve persons ride on any cage or car at one time, nor shall any coal be hoisted out of any coal mine while persons are descending into such coal mine; and the number of persons to ascend out of or descend into any coal mine, on one cage shall be determined by the inspector, the maximum number so fixed shall not be less than four, nor more than twelve, nor shall be lowered or hoisted more rapidly than six hundred feet to the minute.

SEC. 8. All boilers used in generating steam in and about coal mines shall be kept in good order, and the agent, owner or operator, as aforesaid, shall have said boilers examined and inspected by a competent boiler maker, or other qualified person, as often as once every six months, and oftener if the inspector shall deem it necessary, and the result of every such examination shall be certified, in writing, to the mine inspector; and the top of each and every shaft, and the entrance to each and every intermediate working vein, shall be securely fenced by gates properly covering and protecting such shaft and entrance thereto; and the entrance to every abandoned slope, air or other shaft shall be securely fenced off; and every steam boiler shall be provided with a proper steam gauge, water gauge and safety valve; and all underground, self-acting or engine planes, or gangways, on which coal cars are drawn and persons travel, shall be provided with some proper means of signaling between the stopping-places and the end of said planes or gangways, and sufficient places of refuge at the sides of such planes or gangways shall be provided at intervals of not more than twenty feet apart.

SEC. 9. Whenever loss of life, or serious personal injury shall occur by reason of any explosion, or of any accident whatsoever, in or about any coal mine, it shall be the duty of the person having charge of such coal mine to report the facts thereof, without delay, to the mine inspector of the county in which said coal mine is situated; and if any person is killed thereby, to notify the coroner of the county also, or, in his absence or inability to act, any justice of the peace of said county; and the said inspector shall, if he deem it necessary from the facts reported, immediately go to the scene of said accident, and make such suggestions, and render such assistance as he may deem necessary for the safety of the men. And the inspector shall investigate and ascertain the cause of such explosion or accident, and make a report thereof, which he shall preserve with

the other records of his office; and to enable him to make such investigations he shall have power to compel the attendance of witnesses, and administer oaths or affirmations to them, and the cost of such investigations shall be paid by the county in which such accident has occurred, in the same manner as costs of coroners' inquests are now paid. And the failure of the person in charge of the coal mine in which any such accident may have occurred, to give notice to the inspector or coroner, as provided for in this section, shall subject such person to a fine of not less than twenty-five dollars nor more than one hundred dollars, to be recovered in the name of the People of the State of Illinois, before any justice of the peace of such county, and such fine, when collected, shall be paid into the county treasury for the use of the county in which any such accident may have occurred.

SEC. 10. In all cases in which punishment is provided by fine under this act for a breach of any of its provisions the fine for a first offense shall not be less than fifty dollars and not more than two hundred dollars, and for the second offense not less than one hundred dollars or more than five hundred dollars, in the discretion of the court, except as specially provided for in section nine of this act.

SEC. 11. The county board in each and every county in this State in which mining is now or may be hereafter carried on is hereby authorized, and it is made its duty, to appoint an inspector of mines at its September meeting, who shall have been a resident of the county for which he is appointed for one year, previous to his appointment. He shall be required to enter into a bond to the county board of said county for a sum not less than one thousand dollars nor more than three thousands dollars, conditioned upon the faithful performance of his duties; said bond to be accompanied by good and sufficient security, to be approved by the said county board. He shall also take an oath of office as provided for by the constitution, and he shall be required to furnish satisfactory evidence that he has had sufficient practical experience in and around mines to discharge the duties of said office, and to see that the provisions of this act are faithfully complied with. He shall not be interested as owner, stockholder, superintendent or operator, or be interested in operating any mine during his term of office, which shall be one year, but he may be re-appointed as often as the county board may think proper. The county board of such counties shall fix the number of days to be employed by the county inspector in inspecting the different mines in his county, and enter the same upon the records of said board. He shall receive such compensation for his time actually employed in the performance of the duties of his office, to be verified by his affidavit, to be not less than three dollars, nor more than five dollars per day, to be paid out of the county treasury. The county board shall also provide an anemometer [anemometer] and all necessary instruments for testing the air, and in all cases where the inspector finds the provisions of this act, or any of them, not complied with in operating any mine, it is made his duty to demand and, if necessary, compel by law the collection from the owner or operators of such mine all expenses of said inspection as provided in section two (2) of this act: Provided,—however, that in all cases where the county commissioners fail or refuse to appoint a competent and experienced inspector, or where the said inspector fails to attend to or perform, the duties of his office in accordance with the meaning and intent of this act, the Circuit Judge of said county shall, at the request of any ten citizens of said county and upon proper proof of the incompetency or neglect of said inspector to properly perform the duties of his office, remove the said inspector and appoint a properly qualified person to perform the duties of said inspector for the unexpired term. (Amended. See pages 148, 153.)

SEC. 12. The inspector, provided for under this act shall see that every necessary precaution is taken to insure the health and safety of the workmen therein employed; that the provisions and requirements of this act be faithfully observed and obeyed, and the penalties of the law enforced against all who willfully disobey its requirements. He shall also collect and tabulate the following facts, that is to say: The number of acres of workable coal lands in his county; the number and thickness of the coal beds, and their respective depths below the surface; how they are mined, whether by shaft, slope, or drift; the number of mines in operation, the number of men employed therein, and the aggregate yearly production in tons; together with an estimate of the amount of capital employed in coal mining in this county, and any other information relative to coal mining that he may deem necessary; all of which facts so tabulated, together with a statement of the condition of the mine, as to safety and ventilation, and the general result of his examination into the causes of all accidents in and about the coal mines of his county; he shall fully set forth, in an annual report to the Governor, with his recommendations as to such other legislation on this subject as may be proper; he shall also furnish such information as he may have obtained on this subject, when called for by the State geologist. (Amended. See pages 149, 154.)

SEC. 13. It shall be lawful for the inspector, provided for in this act, to enter, examine and inspect any and all coal mines and machinery belonging thereto, at all reasonable times, by day or by night, but so as not to obstruct or hinder the necessary workings of such coal mine, and the owner, agent or operator of every such coal mine is hereby required to furnish all necessary facilities for entering such examination and inspection, and if the said owner, agent or operator aforesaid shall refuse to permit such inspection or to furnish the necessary facilities for such entry, examination and inspection, the inspector shall file his affidavit setting forth such refusal, with the judge of the circuit court in said county in which said mine is situated, either in term time or vacation, or, in the absence of said judge, with the master in chancery in said county in which said mine is situated, and obtain an order on such owner, agent or operator so refusing as aforesaid, commanding him to permit and furnish such necessary facilities for the inspection of such coal mine, or to be adjudged to stand in contempt of court and punished accordingly, and if the said inspector shall, after examination of any coal mine and the works and machinery pertaining thereto, find the same to be worked contrary to the provisions of this act, or unsafe for the workmen therein employed, said inspector shall, through the States attorney of his county, or any attorney, in case of his refusal to act, acting in the name and on behalf of the State, proceed against the owner, agent or operator of such coal mine by injunction without bond, after giving at least two days' notice to such owner, agent or operator; and said owner, agent or operator shall have the right to appear before the judge or master to whom the application is made, who shall hear the same on affidavits and such other testimony as may be offered in support as well as in opposition thereto, and if sufficient cause appear, the court, or judge in vacation, by order shall prohibit the further working of any such coal mine in which persons may be unsafely employed contrary to the provisions of this act, until the same shall have been made safe and the requirements of this act shall have been complied with, and the court shall award such costs in the matter of the said injunction as may be just; but any such proceedings so commenced shall be without prejudice to any other remedy permitted by law for enforcing the provisions of this act.

SEC. 14. For any injury to person or property, occasioned by any wilful violation of this act or wilful failure to comply with any of its provisions, a right of action shall accrue to the party injured for any direct damages sustained thereby; and in case of loss of life by reason of such wilful violation or wilful failure as aforesaid, a right of action shall accrue to the widow of the person so killed, his lineal heirs or adopted children, or to any other person or persons who were before such loss of life, dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives.

SEC. 15. Any miner, workman or other person who shall knowingly injure any water-gauge, barometer, air-course, or brattice, or shall obstruct, throw open any airways, or carry any lighted lamps or matches into places that are worked by the light of safety lamps, or shall handle or disturb any part of the machinery of the hoisting engine, or open a door in the mine and not have the same closed again, whereby danger is produced either to the mine or those at work therein; or who shall enter into any part of the mine against caution; or who shall disobey any order given in pursuance of this act; or who shall do any willful act whereby the lives and health of persons working in the mine, or the security of the mine or mines, or the machinery thereof, is endangered, shall be deemed guilty of a misdemeanor, and, upon conviction, shall be punished by fine or imprisonment at the discretion of the court.

SEC. 16. The owner, agent or operator of any coal mine shall keep a sufficient supply of timber, where required to be used as props, so that the workmen may at all times be able to properly secure the said workings from caving in; and it shall be the duty of the owner, agent or operator to send down all such props when required.

SEC. 17. All acts or parts of acts inconsistent with the provisions of this act are and the same are hereby repealed.

FIRST AMENDATORY ACT, 1883.

LAW 1883, P. 116.

JUNE 18, 1883.

AN ACT to amend sections 1, 3, 6, 9, 11, and 12 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, and making the necessary appropriations for carrying out the provisions of the same.

SECTION 1. Be it enacted, etc.: That sections 1, 3, 6, 9, 11 and 12 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, be amended so as to read as follows:

SEC. 1. That the owner, or agent, or operator of each and every coal mine in this State, shall make, or cause to be made, at the discretion of the inspector, or person acting in that capacity, an accurate map or plan of the workings of such coal mine, and of each and every vein thereof, showing the general inclination of the strata, together with any material deflections in said workings, and the boundary lines of said coal mines, and deposit a true copy of said map or plan with the inspector of coal mines, to be filed in his office, and another true copy of said map or plan with the recorder of the county in which said coal mine is situated, to be filed in his office, both of which said copies shall be deposited as aforesaid within three (3) months from the day when this act shall go into effect; and the original, or a copy of such map or plan, shall also be kept for inspection at the office of such coal mine; and during the month of January, of each and every year after this act shall go into effect, the said owner, agent or operator shall furnish the inspector and recorder, as aforesaid,

with a statement and further map or plan of the progress of the workings of such coal mine, continued from the last report to the end of the December month just preceding; and the inspector shall correct his map or plan of said workings in accordance with the statement and map or plan thus furnished; and when any coal mine is worked out or abandoned, that fact shall be reported to the inspector, and the map or plan of such coal mine in the office of said inspector shall be carefully corrected and verified. The several coal mine inspectors in this State shall furnish copies of all maps or plans of mines to be filed with the Bureau of Labor Statistics.

Sec. 3. In all coal mines that are or have been in operation prior to the first day of July, in the year of our Lord 1879, and which are worked by or through a shaft, slope or drift, if there is not already an escapement shaft to each and every said coal mine, or communication between each and every coal mine, and some other contiguous mine, then there shall be an escapement shaft or other communication, such as shall be approved by the mine inspector, making at least two distinct means of ingress and egress for all persons employed or permitted to work in such coal mines. Such escapement shaft or other communication with a contiguous mine as aforesaid, shall be constructed in connection with every vein or stratum of coal worked in such coal mine, which shall be at least three and one-half feet high and at least five feet wide, and in no instance shall the height of said roadway be less than the thickness of the vein or stratum of coal through which it is driven; and the time to be allowed for such construction shall be one year when such mine is under one hundred (100) feet in depth; two years when such mine is over one hundred (100) feet in depth and under three hundred (300) feet, and three years when it is over three hundred (300) feet and under four hundred (400) feet, and four years when it is over four hundred (400) feet in depth, and five years for all mines over five hundred (500) feet, from the first day of July, A. D. 1879; and in all cases where the working force (face) of one mine has been driven up to or into the workings of another mine, the respective owners of such mine, while operating the same, shall keep open a roadway at least five feet high and five feet wide, thereby forming a communication as contemplated in this act; and for a failure to do so shall be subject to the penalty provided for in section 10 of this act, for each and every day such roadway is unnecessarily closed; each and every such escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the men employed in such mines, such distance to be left to the discretion of the mine inspector or person acting in that capacity, and in all coal mines that shall go into operation for the first time after the first day of January A. D. 1880. And in all cases where such mine or mines shall hereafter be put in operation in this State, the owner thereof or the lessee or occupant of the same shall construct such an escapement shaft as is now required by law in this State, at the rate of two hundred feet per annum, until such escapement shaft shall have been completed: And provided, further, that nothing in this section shall be construed to extend the time heretofore allowed by law for constructing escapement shafts in mines going into operation for the first time before said first day of January, A. D. 1880.

Sec. 6. The owner, agent or operator of every coal mine operated by shaft shall provide suitable means of signaling between the bottom and top thereof, and shall also provide safe means of hoisting and lowering persons in a cage covered with boiler iron, so as to keep safe, as far as possible, persons descending into and ascending out of such shaft; and such cage shall be furnished with guides to conduct it on slides through such shaft, with a sufficient brake on every drum to prevent accident in case of the giving out or breaking of the

machinery; and such cage shall be furnished with spring catches intended and provided, as far as possible, to prevent the consequences of cable-breaking or the loosening or disconnecting of the machinery; and no props or rails shall be lowered in a cage while men are descending into or ascending out of said mine: Provided, that the provisions of this section in relating to covering cages with boiler iron, shall not apply to coal mines less than one hundred (100) feet in depth where the coal is raised by horse-power. No person under the age of fourteen years, or females of any age, shall be permitted to enter any mine to work therein. Any party or person neglecting or refusing to perform the duties required to be performed by sections 3, 4, 5, 6, 7, and 8, shall be deemed guilty of a misdemeanor, and punished by fine in the discretion of the court trying the same, subject, however, to the limitations as provided by section 10 of this act.

SEC. 9. Whenever loss of life, or serious personal injury, shall occur by reason of any explosion, or of any accident whatsoever, in or about any coal mine, it shall be the duty of the person having charge of such coal mine, to report the facts thereof, without delay, to the mine inspector of the district in which said coal mine is situated; and if any person is killed thereby, to notify the coroner of the county also, or, in his absence or inability to act, any justice of the peace of said county; and the said inspector shall, if he deem it necessary from the facts reported, immediately go to the scene of said accident, and make such suggestions and render such assistance as he may deem necessary for the safety of the men. And the inspector shall investigate and ascertain the cause of such explosion or accident, and make a report thereof, which he shall preserve with the other records of his office; and to enable him to make such investigations he shall have the power to compel the attendance of witnesses, and administer oaths or affirmations to them, and the cost of such investigations shall be paid by the county in which such accident has occurred, in the same manner as costs of coroners' inquests are now paid. And the failure of the person in charge of the coal mine in which any such accident may have occurred, to give notice to the inspector or coroner, as provided for in this section, shall subject such person to a fine of not less than twenty-five (\$25) dollars, nor more than one hundred dollars (\$100), to be recovered in the name of the People of the State of Illinois, before any justice of the peace of such county, and such fine, when collected, shall be paid into the county treasury for the use of the county in which any such accident may have occurred.

SEC. 11. This State shall be divided into five inspection districts, as follows, viz: The first district shall be composed of the counties of Boone, McHenry, Lake, DeKalb, Kane, DuPage, Cook, LaSalle, Kendall, Grundy, Will, Livingston, Kankakee and Iroquois. Second district, the counties of Jo Daviess, Stephenson, Winnebago, Carroll, Ogle, Whiteside, Lee, Rock Island, Henry, Bureau, Mercer, Stark, Putnam, Marshall, Henderson, Warren, Knox, Hancock, McDonough, Schuyler, Adams and Brown. The third district, the counties of Fulton, Peoria, Woodford, Tazewell, McLean, Ford, Mason, Cass, Menard, Logan, DeWitt, Platt, Champaign and Vermillion. The fourth district, the counties of Pike, Scott, Morgan, Sangamon, Calhoun, Greene, Jersey, Madison, Bond, Macoupin, Montgomery, Christian, Fayette, Macon, Moultrie, Shelby, Effingham, Douglas, Coles, Cumberland, Jasper, Edgar, Clark, Crawford, Clay, Richland and Lawrence. The fifth district, the counties of St. Clair, Clinton, Washington, Marion, Jefferson, Wayne, Edwards, Wabash, Hamilton, White, Monroe, Randolph, Perry, Jackson, Franklin, Williamson, Saline, Gallatin, Union, Johnson, Pope, Hardin, Alexander, Pulaski, and Massac. The Governor shall, upon the recommendation of a board of examiners selected for that purpose, composed of two practical coal miners, two coal operators, and one mining

engineer, to be appointed by the Bureau of Labor Statistics of this State, all of whom shall be sworn to a faithful discharge of their duties, appoint five properly qualified persons to fill the offices of inspectors of coal mines of this State (being one inspector for each district provided for in this act), whose commissions shall be for the term of one year, but they shall at all times be subject to removal from office for neglect of duty, or misfeasance in the discharge of duty, as hereinafter provided for; and the inspectors so appointed shall have attained the age of thirty years, be citizens of this State, and have a knowledge of mining engineering sufficient to conduct the development of coal mines, and a practical knowledge of the methods of conducting mining for coal in the presence of explosive gases, and of the proper ventilation of coal mines. They shall have had a practical mining experience of ten years, and shall not be interested as owner, operator, stockholder, superintendent or mining engineer of any coal mine during their term of office, and shall be of good moral character and temperate habits, and shall not be guilty of any act tending to the injury of miners or operators of mines during their term of office. They shall be provided by the State with the most approved modern instruments for carrying out the intentions of this act. The inspectors, before assuming the duties of their several offices, shall take an oath of office as provided for by the constitution, and shall be required to enter into a bond to the State in the sum of five thousand dollars (\$5,000), with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular, as required by this act; said bond, with the approval of the Governor endorsed thereon, together with the oath of office, shall be deposited with the Secretary of State. The salaries of the inspectors provided for by this act shall be eighteen hundred dollars (\$1,800) per annum, each, and the Auditor of Public Accounts is hereby authorized to draw his warrant on the treasury in their favor, quarterly, for the amount specified in this section for the salary of each inspector: Provided, that the county board of any county may appoint an assistant inspector for such county, who shall act under the direction of the district inspector in the performance of his duties, and shall receive not less than three dollars (\$3) nor more than five dollars (\$5) per day, for the time actually employed, to be paid out of the county treasury; and he may be removed by such county board at any time.

SEC. 12. The inspectors provided for by this act shall devote their whole time and attention to the duties of their office, and make personal examination of every mine within their respective districts, and shall see that every necessary precaution is taken to insure the health and safety of the workmen employed in such mines, and that the provisions and requirements of the mining laws of this State are faithfully observed and obeyed, and the penalties of same enforced. They shall also make annual reports to the Bureau of Labor Statistics of their acts during the year in the discharge of their duties, with the recommendations as to the legislation necessary on the subject of mining, and shall collect and tabulate upon blanks furnished by said Bureau all desired statistics of the mines and miners within their districts, to accompany said annual report; they shall also furnish such information as they may have obtained on this subject, when called for, to the State Geologist. Upon a petition signed by not less than three reputable coal operators, or ten coal miners, setting forth that any inspector of coal mines neglects his duties, or that he is incompetent, or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, it may be lawful for the Bureau of Labor Statistics of this State to issue a citation to the said inspector to appear at no less than fifteen days' notice, on a day fixed, before them, when the said Bureau shall proceed to inquire into and investigate the allegations of

the petitioners; and if the said Bureau find that the said inspector is neglectful of his duty, or that he is by reason of causes that existed before his appointment, or that have arisen since his appointment, incompetent to perform the duties of said office, or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, the said Bureau shall declare the office of inspector of the said district vacant, and a properly qualified person shall be appointed to fill the office in compliance with the provisions of this act; and the cost of said investigation by the said Bureau shall be borne by the removed inspector; but if the allegations of the petitions are not sustained by the final decision of said Bureau, the costs shall be paid by the petitioners. The board of examiners provided for in section eleven of this act, shall be appointed at the annual meeting of the Bureau of Labor Statistics, and shall hold their offices one year. They shall meet annually at the State capital on the first Monday in September, in each year, and special meetings may be called at any time by the Bureau of Labor Statistics when the office of coal mine inspector becomes from any cause vacant. They shall receive as compensation the sum of three dollars (\$3) per day, each, for time actually employed in the duties of their office, and actual traveling expenses, to be verified by affidavit: Provided, that in no case shall the per diem received by any member of said board exceed the sum of thirty dollars (\$30) per annum. The Auditor of Public Accounts is hereby authorized to draw his warrant in favor of each member of the board of examiners at the close of their annual session for the full amount due them for attending annual and special sessions, and expenses, upon vouchers sworn to by them and approved by the Secretary of the Bureau of Labor Statistics, and the Governor.

SECOND AMENDATORY ACT, 1883.

LAWS 1883, P. 114.

JUNE 21, 1883.

AN ACT to amend section 4 of "An act providing for the health and safety of persons employed in coal mines," and to further amend said act by adding thereto sections to be numbered 18 and 19, approved May 28, 1878, in force July 1, 1879.

SECTION 1. Be it enacted, etc.: That section 4 of an act entitled "An act providing for the health and safety of persons employed in coal mines," be and is hereby amended to read as follows, and that said act be and is hereby amended by adding thereto the following sections, numbered 18 and 19:

SEC. 4. The owner, agent or operator of every coal mine, whether operated by shaft, slope or drift, shall provide and maintain for every such mine a sufficient amount of ventilation, to be determined by the inspector, at the rate of one hundred cubic feet of air per man per minute, measured at the foot of the down cast, which shall be forced and circulated to the face of every working place throughout the mine, so that said mine shall be free from standing gas of whatsoever kind; and in all mines where fire-damp is generated, every working place where such fire-damp is known to exist shall be examined every morning with a safety lamp, by a competent person, before any other persons are allowed to enter. The ventilation required by this section may be produced by any suitable appliances, but in case a furnace shall be used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works, by lining the up-cast with incombustible material for a sufficient distance up from said furnace: Provided, it shall not be lawful to use a furnace for ventilating purposes, or for any other purpose, that shall emit smoke into any compartment constructed in or adjoining any coal hoisting shaft or slope, where the hoisting shaft or slope is the only means provided for the ingress or egress of persons employed in said coal mines. That it shall

be unlawful where there is but one means of ingress and egress provided at a coal shaft or slope, to construct and use a ventilating furnace that shall emit smoke into a shaft as an up-cast, where the shaft or slope used as a means of ingress and egress by persons employed in said coal mines is the only means provided for furnishing air to persons employed therein.

Sec. 18. That all mines hoisting coal by steam power from shaft or slope, having no other means of ingress or egress than that afforded to persons employed therein than by said shaft or slope, shall, within ninety days after July the first, A. D. 1883, have all engine and boiler houses roofed and sided with fire-proof materials, and they shall be situated not less than fifty feet from the mouth of the said shaft or slope; that the hoisting derricks erected over said hoisting shaft or near said slope, if inclosed, and all the coal chutes, buildings and construction within a radius of fifty feet of the mouth of the said hoisting shaft or slope, shall be covered and sided with fire-proof materials, and the person in charge, the owners or operators thereof, shall provide a steam pump and have the same conveniently situated, and a sufficient supply of water and hose, always ready for use in any part of the buildings, chutes or constructions within a radius of fifty feet of said coal-hoisting shaft or slope; and if the person in charge of any such coal shaft or slope shall refuse or neglect to comply with the provisions of this act, then the inspector of coal mines for the county in which the said shafts or slope are situated shall proceed, through the State's attorney of his county, or any attorney, in case of his refusal to act, acting in the name and on behalf of the State, against the owner, agent or operator of said shaft or slope, by information without bond, after giving at least two days' notice to such owner, agent or operator; and the said owner, agent or operator shall have the right to appear before the judge or master to whom the application is made, who shall hear the same on affidavits, and such other testimony as may be offered, in support as well as in opposition thereto; and if it be found that the owner, agent or operator of said shaft or slope has refused or neglected to comply with the provisions of this act, the court, or judge in vacation, by order, shall prohibit the further working of any such coal shaft or slope until the owner, agent or operator shall have complied with the terms of this act.

Sec. 19. That all miners and employes engaged in mining coal shall use copper needles, in preparing blasts in coal, and not less than five (5) inches of copper on the end of all iron bars used for tamping blasts of powder in coal, and the use of iron needles, and iron tamping bars, not tipped with five inches of copper, is hereby declared to be unlawful. Any failure on the part of a coal miner, or an employe in any coal mine, to conform to the terms and requirements of this act shall subject such miner or employe to a fine of not less than five dollars, nor more than twenty-five dollars with costs of prosecution, for each offense, to be recovered by civil suit, before any justice of the peace, said fines, when collected, to be paid into the treasury of the county where the offense was committed, to the credit of the fund provided for the payment of the county inspector of mines.

THIRD AMENDATORY ACT, 1885.

LAW 1885, P. 117.

JUNE 20, 1885.

AN ACT to amend sections 3, 4, 11, and 12 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended by acts approved June 18, 1883, and June 21, 1883, in force July 1, 1883.

SECTION 1. Be it enacted, etc.: That sections 3, 4, 11 and 12 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended by acts approved June

18, 1883, and June 21, 1883, in force July 1, 1883, be amended so as to read as follows:

NOTE.—The original sections have been previously amended. See page 146.

SEC. 3. In all coal mines that are or have been in operation prior to the first day of July, in the year of our Lord 1879, and which are worked by or through a shaft, slope or drift, if there is not already an escapement shaft to each and every said coal mine, or communication between each and every coal mine, and some other contiguous mine, then there shall be an escapement shaft or other communication, such as shall be approved by the mine inspector, making at least two distinct means of ingress and egress for all persons employed or permitted to work in such coal mine. Such escapement shaft or other communication with a contiguous mine as aforesaid, shall be constructed in connection with every vein or stratum of coal worked in such coal mine, which shall be at least three and one-half feet high and at least five feet wide, and in no instance shall the height of said roadway be less than the thickness of the vein or stratum of coal through which it is driven; and the time to be allowed for such construction shall be one year when such mine is under one hundred (100) feet in depth; two years when such mine is over one hundred (100) feet in depth and under three hundred (300) feet, and three years when it is over three hundred (300) feet and under four hundred (400) feet, and four years when it is over four hundred (400) feet in depth, and five years for all mines over five hundred (500) feet, from the first day of July, A. D. 1879; and in all cases where the working force of one mine has been driven up to or into the workings of another mine, the respective owners of such mines, while operating the same, shall keep open a roadway, at least five feet high and five feet wide, thereby forming a communication, as contemplated in this act; and for a failure to do so shall be subject to the penalty provided for in section 10 of this act, for each and every day such roadway is unnecessarily closed; each and every such escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the men employed in such mines, such distance to be left to the discretion of the mine inspector or person acting in that capacity, and shall be equipped with stairways or ladders having landing places or platforms at least every twenty feet from the bottom to the top, or in lieu thereof such hoisting apparatus as will enable the employes in the mine to make safe and speedy exit in case of danger. In all coal mines that shall go into operation for the first time after the first day of January, A. D. 1880, and in all cases where such mine or mines shall hereafter be put in operation in this State, the owner thereof, or the lessee or occupant of the same, shall construct such an escapement shaft as is now required by law in this State, at the rate of two hundred feet per annum until such escapement shaft shall have been fully completed: And, provided, further, that nothing in this section shall be construed to extend the time heretofore allowed by law for constructing escapement shafts in mines going into operation for the first time before said first day of January, A. D. 1880.

SEC. 4. The owner, agent or operator of every coal mine, whether operated by shaft, slope or drift, shall provide and maintain in every such mine a good and sufficient amount of ventilation for such men and animals as may be employed therein, the amount of air in circulation to be in no case less than one hundred cubic feet for each man and six hundred cubic feet for each animal per minute, measured at the foot of the down-cast, and the same to be increased at the discretion of the inspector, according to the character and extent of the workings, or the amount of powder used in blasting; and said volume of air shall be forced and circulated to the face of every working place throughout the mine, so that said mine shall be free from standing powder smoke, and gases of

every kind. In all mines where fire-damp is generated, every working place, where the same is known or thought to exist, shall be examined every morning with a safety lamp, by a competent person, before any other persons are allowed to enter, and wherever the inspector shall find men working without sufficient air, or under any unsafe condition, he may remove the same to other parts of the mine or from the mine altogether. The ventilation required by this section may be produced by any suitable appliances, but in case a furnace shall be used for ventilating purposes it shall be built in such a manner as to prevent the communication of fire to any part of the works, by lining the up cast with incombustible material for a sufficient distance up from said furnace: Provided, it shall not be lawful to use a furnace for ventilating purposes, or for any other purpose, that shall emit smoke into any compartment constructed in, or adjoining any coal-hoisting shaft or slope, where the hoisting shaft or slope is the only means provided for the ingress or egress of persons employed in said coal mines. That it shall be unlawful, where there is but one means of ingress and egress provided at a coal shaft or slope, to construct and use a ventilating furnace that shall emit smoke into a shaft, as an up-cast, where the shaft or slope used as a means of ingress and egress by persons employed in said coal mines is the only means provided for furnishing air to persons employed therein."

SEC. 11. This State shall be divided into five inspection districts, as follows, viz: The first district shall be composed of the counties of Boone, McHenry, Lake, DeKalb, Kane, DuPage, Cook, LaSalle, Kendall, Grundy, Will, Livingston, Kankakee and Iroquois. Second district, the counties of Jo Daviess, Stephenson, Winnebago, Carroll, Ogle, Whiteside, Lee, Rock Island, Henry, Bureau, Mercer, Stark, Putnam, Marshall, Henderson, Warren, Knox, Hancock, McDonough, Schuyler, Adams and Brown. The third district, the counties of Fulton, Peoria, Woodford, Tazewell, McLean, Ford, Mason, Cass, Menard, Logan, DeWitt, Piatt, Champaign and Vermillion. The fourth district, the counties of Pike, Scott, Morgan, Sangamon, Calhoun, Greene, Jersey, Madison, Bond, Macoupin, Montgomery, Christian, Fayette, Macon, Moultrie, Shelby, Effingham, Douglas, Coles, Cumberland, Jasper, Edgar, Clark, Crawford, Clay, Richland and Lawrence. The fifth district, the counties of St. Clair, Clinton, Washington, Marion, Jefferson, Wayne, Edwards, Wabash, Hamilton, White, Monroe, Randolph, Perry, Jackson, Franklin, Williamson, Saline, Gallatin, Union, Johnson, Pope, Hardin, Alexander, Pulaski, and Massac. The Governor shall, upon the recommendation of a board of examiners, selected for that purpose, composed of two practical coal miners, two coal operators, and one mining engineer, to be appointed by the Bureau of Labor Statistics of this State, all of whom shall be sworn to a faithful discharge of their duties, appoint five properly qualified persons to fill the offices of inspectors of coal mines of this State (being one inspector for each district provided for in this act), whose commissions shall be for the term of two years, but they shall at all times be subject to removal from office for neglect of duty, or malfeasance in the discharge of duty, as hereinafter provided for; and the inspectors so appointed, shall have attained the age of thirty years, be citizens of this State, and have a knowledge of mining engineering sufficient to conduct the development of coal mines, and a practical knowledge of the methods of conducting mining for coal in the presence of explosive gases, and of the proper ventilation of coal mines. They shall have had a practical mining experience of ten years, and shall not be interested as owner, operator, stockholder, superintendent or mining engineer of any coal mine during their term of office, and shall be of good moral character and temperate habits, and shall not be guilty of any act tending to the injury of miners or operators of mines during their term of office. They shall be pro-

vided by the State with the most approved modern instruments for carrying out the intention of this act. The inspectors, before assuming the duties of their several offices, shall take an oath of office, as provided for by the constitution, and shall be required to enter into a bond to the State in the sum of five thousand dollars (\$5,000), with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular, as required by this act; said bond, with the approval of the Governor endorsed thereon, together with the oath of office, shall be deposited with the Secretary of State. The salaries of the inspectors, provided for by this act, shall be eighteen hundred dollars (\$1,800) per annum, each, and the Auditor of Public Accounts is hereby authorized to draw his warrant on the treasury in their favor, quarterly, for the amount specified in this section for the salary of each inspector; Provided, that the county board of any county may appoint an assistant inspector for such county, who shall act under the direction of the district inspector in the performance of his duties, and shall receive not less than three dollars (\$3), nor more than five dollars (\$5) per day for the time actually employed, to be paid out of the county treasury; and he may be removed by such county board at any time.

Sec. 12. The inspectors provided for by this act shall devote their whole time and attention to the duties of their office, and make personal examination of every mine within their respective districts, and shall see that every necessary precaution is taken to insure the health and safety of the workmen employed in such mines, and that the provisions and requirements of the mining laws of this State are faithfully observed and obeyed and the penalties of the same enforced. They shall also make annual reports to the Bureau of Labor Statistics of their acts during the year in the discharge of their duties, with their recommendation as to legislation necessary on the subject of mining, and shall collect and tabulate upon blanks furnished by said Bureau all desired statistics of the mines and miners within their districts, to accompany said annual report; they shall also furnish such information as they may have obtained on this subject, when called for, to the State Geologist. Upon a petition signed by not less than three reputable coal operators, or ten coal miners, setting forth that any inspector of coal mines neglects his duties, or that he is incompetent or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, it may be lawful for the Bureau of Labor Statistics of this State to issue a citation to the said inspector to appear, at not less than fifteen days' notice, on a day fixed, before them, when the said Bureau shall proceed to inquire into and investigate the allegations of the petitioners; and if the said Bureau find that the said inspector is neglectful of his duty, or that he is, by reason of causes that existed before his appointment, or that have arisen since his appointment, incompetent to perform the duties of said office, or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, the said Bureau shall declare the office of inspector of the said district vacant, and a properly qualified person shall be appointed to fill the office in compliance with the provisions of this act; and the cost of said investigation by the said Bureau shall be borne by the removed inspector; but if the allegations of the petitioners are not sustained by the final decision of the said Bureau, the costs shall be paid by the petitioners. The board of examiners provided for in section 11 of this act shall be appointed by the Bureau of Labor Statistics, and shall hold their offices for two years. They shall meet annually at the State capital on the second Monday in September, and special meetings may be called at any time by the Bureau of Labor Statistics when the office of coal mine inspector becomes, from any cause, vacant. They shall receive as

compensation the sum of three dollars (\$3) per day, each, for time actually employed in the duties of their office, and actual traveling expenses to be verified by affidavit: Provided, that in no case shall the per diem received by any member of said board exceed the sum of thirty dollars (\$30) per annum. The Auditor of Public Accounts is hereby authorized to draw his warrant in favor of each member of the board of examiners, at the close of their annual session, for the full amount due them for attending annual and special sessions and expenses, upon vouchers sworn to by them and approved by the secretary of the Bureau of Labor Statistics and the Governor: And, provided, further, that when two or more coal mines are so located as to allow the said mines to be connected by permanent entries between, and the land or mining rights lying between such mines is owned by any person or persons with whom the owner or owners of said mine or mines are unable to agree for the purchase of the right of way for the connecting entry or entries between such mines, and the right to maintain and use such entry as a connecting entry, such owner or owners of any such coal mine or mines, or either of them, may acquire such right or title in the manner that may be now or hereafter provided for by any law of eminent domain.

FOURTH AMENDATORY ACT, 1887.

LAWS 1887, P. 231.

JUNE 16, 1887.

An ACT to amend section 3 as amended June 18, 1883, in force July 1, 1883, and amended June 30, 1885, in force July 1, 1885, section 4 as amended June 21, 1883, in force July 1, 1883, and amended June 30, 1885, in force July 1, 1885, section 6 as amended June 18, 1883, in force July 1, 1883, section 7, section 8, section 14 and section 16 of an act entitled "An act to provide for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended June 18, 1883, and June 21, 1883, in force July 1, 1883, as amended June 30, 1885, in force July 1, 1885.

SECTION 1. Be it enacted, etc.: That sections 3, 4, 6, 7, 8, 14, and 16 of "An act to provide for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended June 18, 1883, and June 21, 1883, in force July 1, 1883, and as amended June 30, 1885, and in force July 1, 1885, be and are hereby amended to read as follows:

SEC. 3. In all coal mines that are, or have been, in operation prior to the first day of July, 1879, and which are worked by or through a shaft, slope or drift, if there is not already an escapement to each and every said coal mine, or a communication between every such coal mine and some other contiguous mine, then there shall be an escapement shaft or such other communication as shall be approved by the mine inspector, making at least two distinct means of ingress and egress for all persons employed or permitted to work in such coal mine. Such escapement shaft or communication with a contiguous mine, as aforesaid, shall be constructed in connection with every vein or stratum of coal worked in such mine, and all passage ways communicating with the escapement shafts or places of exit from main hauling way to the escapement shaft shall be at least five feet wide and five feet high. In all cases where the working face of one mine has by the agreement of adjacent owners been driven into the workings of another mine, the respective owner of such mine while operating the same shall keep open a roadway at least five feet wide and five feet high, thereby forming a communication as contemplated in this act, and in no case hereafter shall the workings of any mine be driven closer than ten feet to the line of land of any adjacent owner without the written consent of such owner. And in all cases where the shaft of one mine has been used or may be hereafter used as an air or escapement shaft for another mine, neither owner or operator shall close or

obstruct his shaft or workings so as to prevent the use of the same as an escapement or air shaft without first giving one year's notice in writing to the other operator or owner of his intention to abandon his mine. But the operator continuing the working of his mine shall be at the expense of keeping such abandoned workings in repair; each and every such escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the men employed in such mines; and before any escapement shaft shall be located, or the excavations for it begun, the district inspector of mines shall be duly notified to appear and determine what shall be a suitable distance for the same; the distance from main shaft for such escapement shaft shall not be less than 300 feet without the consent of the mine inspector, nor more than 300 feet without the consent of the operator. Such escapement shafts as shall be equipped after the passage of this act shall be supplied with stairways, partitioned off from the main airway, and having substantial handrails and platforms, and such stairways shall be built at an angle not greater than forty-five degrees: Provided, that in lieu of stairways such hoisting apparatus may be substituted as will insure the safe and speedy removal of persons employed in such mines in case of danger. No accumulations of ice shall be permitted in any escapement shaft nor any obstructions to travel upon any stairways or ladders. The time to be allowed for sinking such escapement shafts as are now required by law, shall be one year for sinking any shaft two hundred feet or less in depth, and one additional year, or pro rata portion thereof, for every additional two hundred feet or fraction thereof. Time shall be reckoned from the date on which coal is first hoisted from the original shaft for sale or use; and it shall be the duty of the inspectors of mines to see that all escapement shafts are begun in time to secure their completion within the period here specified; And, provided further, that nothing in this section shall be construed to extend the time heretofore allowed by law for constructing escapement shafts.

SEC. 4. The owner, agent or operator of every coal mine whether operated by shaft, slope or drift, shall provide and maintain for every such mine a good and sufficient amount of ventilation for such men and animals as may be employed therein, the amount of air in circulation to be in no case less than one hundred cubic feet for each man and six hundred cubic feet for each animal, per minute, measured at the foot of the downcast, and the same to be increased at the discretion of the inspector according to the character and extent of the workings, or the amount of powder used in blasting; and said volume of air shall be forced and circulated to the face of every working placed through the mine, so that said mine shall be free from standing powder, smoke and gases of every kind. Whenever the inspector shall find men working without sufficient air, or under any unsafe conditions, he shall first give the operator a reasonable notice to rectify same, and upon his refusal so to do may himself order them out until said portions of said mine shall be put in proper condition. All mines in which men are employed shall be examined every morning by a duly authorized agent of the proprietor, to determine whether there are any dangerous accumulations of gas, or lack of proper ventilation, or obstructions to roadways, or any other dangerous conditions, and no person shall be allowed to enter the mine until such examiner shall have reported all the conditions safe for beginning work. Such examiner shall make a daily record of the condition of the mine in a book kept for that purpose, which shall be open at all times to the examination of the inspector. The currents of air in mines shall be split so as to give a separate current to at least every one hundred men at work, and inspectors shall have discretion to order a separate current for a smaller number of men if special conditions render it necessary. The ventilation required by this section may be produced by any suitable appliances,

but in case a furnace shall be used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works, by lining the upcast with incombustible material for a sufficient distance from said furnace: Provided, it shall not be lawful to use a furnace for ventilating purposes, or for any other purpose, that shall emit smoke into any compartment constructed in, or adjoining any hoisting shaft or slope where the hoisting shaft or slope is the only means provided for the ingress and egress of persons employed in said coal mines. That it shall be unlawful, where there is but one means of ingress and egress provided at a coal shaft or slope, to construct and use a ventilating furnace that shall emit smoke into a shaft, as an upcast, where the shaft or slope used as a means of ingress and egress by persons employed in said coal mines is the only means provided for furnishing air to persons employed therein.

SEC. 6. The owner, agent or operator of every coal mine operated by shaft shall provide safe means of hoisting and lowering persons in a cage covered with boiler iron, so as to keep safe, so far as possible, persons descending into and ascending out of such shaft, and such cage shall be furnished with guides to conduct it on slides through such shaft, with a sufficient brake on every drum to prevent accident in case of the giving out or breaking of the machinery; and such cage shall be furnished with safety catches, intended and provided as far as possible to prevent the consequences of cable-breaking or the loosening or disconnecting of machinery. No person under the age of fourteen years, nor females of any age, shall be permitted to enter any mine to work therein; and before any boy shall be permitted to work in any mine, he shall be required to produce an affidavit from his parent or guardian, sworn and subscribed to before a justice of the peace or notary public, that said boy is fourteen years of age. Such affidavits of all the boys employed in any mine shall be produced upon the demand of the inspector. The owner, agent or operator of every coal mine operated by shaft and by steam power, shall place competent persons at the top and bottom of such shaft for the purpose of attending to the signals while men are being lowered into or hoisted out of the mine; they shall be at their post of duty at least thirty minutes before the hoisting of coal is commenced in the morning, and remain at least thirty minutes after the hoisting of coal has ceased at night. It shall also be their duty to see that the men do not carry any tools, timber or material with them on the cage, and that only the proper number of men are allowed upon the cage at one time. A sufficient light shall be furnished at the top and bottom of the shaft to insure as far as possible the safety of persons getting on or off the cage. The following code of signals between the top man, bottom man and engineer are prescribed for use at all mines operated by shaft and by steam power:

FROM THE BOTTOM TO THE TOP.—

One bell shall signify to hoist coal or empty cage, and also to stop either when in motion.

Two bells shall signify to lower cage.

Three bells shall signify that men are coming up. When return signal is received from the engineer, men will get on the cage and ring one bell to start.

Four bells shall signify to hoist slowly, implying danger.

FROM THE TOP TO THE BOTTOM.—

One bell shall signify all ready, get on the cage.

Two bells shall signify send away empty cage.

Provided, that the manager of any mine may add to this code of signals in his discretion for the purpose of promoting their efficiency, or the safety of

the men, but any code which may be established shall be conspicuously posted at the top and bottom of the shaft and in the engine room. Any person neglecting or refusing to perform the duties required to be performed by sections 3, 4, 5, 6, 7 and 8 of this act shall be deemed guilty of a misdemeanor and punished by fine in the discretion of the court trying the same, subject, however, to the limitations as provided by section 10 of this act.

SEC. 7. No owner, agent or operator of any coal mine operated by shaft or slope shall place in charge of any engine whereby men are lowered into or hoisted from the mine, any other than competent, experienced and sober engineers and firemen, and they shall not be less than eighteen years of age. No person shall ride upon a loaded cage or car used for hoisting purposes in any shaft or slope, and in no case shall more than twelve persons ride on any cage or car at one time, nor shall any coal be hoisted out of any coal mine while persons are descending into such mine. The number of persons permitted to ascend out of or descend into any coal mine at one time shall be determined by the inspector; and they shall not be lowered or hoisted more rapidly than six hundred feet per minute. Whenever a cage load of persons shall come to the bottom to be hoisted out, who have finished their day's work or otherwise been prevented from working, an empty cage shall be given them to ascend, except in mines having slopes or provided with stairways in escapement shafts.

SEC. 8. All boilers used in generating steam in and about coal mines shall be kept in good order, and the agent, owner or operator, as aforesaid, shall have said boilers examined and inspected by a competent boiler maker or other qualified person as often as once every six months, and oftener if the inspector shall deem it necessary, and the result of every such examination shall be certified in writing to the mine inspector; and the top of each and every shaft, and the entrance to each and every intermediate working vein, shall be securely fenced by gates, properly protecting such shaft and entrance thereto; and the entrance to every abandoned slope, air or other shaft shall be securely fenced off; and every steam boiler shall be provided with a proper steam gauge, water gauge and safety valve; and all underground, self-acting or engine planes, or gangways, on which coal cars are drawn and persons travel, shall be provided with some proper means of signaling between the stopping places and the ends of said planes or gangways, and sufficient places of refuge at the sides of such planes or gangways shall be provided at intervals of not more than twenty yards, and they shall be not less than six feet wide and six feet in depth, and shall be white-washed or otherwise distinguished from the surrounding walls. The bottom of every shaft shall be supplied with a traveling-way to enable men to pass from one side of the shaft to the other without passing under or over the cages. All sumps shall be securely planked over so as to prevent accidents to men.

SEC. 14. For any injury to person or property occasioned by any wilful violations of this act or wilful failure to comply with any of its provisions, a right of action shall accrue to the party injured for any direct damages sustained thereby; and in case of loss of life by reason of such wilful violation or wilful failure, as aforesaid, a right of action shall accrue to the widow of the person so killed, his lineal heirs or adopted children, or to any other person or persons who were before such loss of life dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives; not to exceed the sum of five thousand dollars.

SEC. 16. The owner, agent or operator of every coal mine shall keep a supply of timber constantly on hand of sufficient length and dimensions to be used as props and cap-pieces, and shall deliver the same as required, with the miners' empty car, so that the workmen may at all times be able to properly secure said workings for their own safety.

FIFTH AMENDATORY ACT, 1889.

LAWS 1889, P. 202.

JUNE 4, 1889.

AN ACT to amend sections 1, 2, 3, 4 and 8 of an act entitled "An act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 1, 2, 3, 4, and 8 of an act entitled "An act to provide for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended June 18, 1883, and June 21, 1883, in force July 1, 1883, and as amended June 30, 1885, in force July 1, 1885, and as amended June 16, 1887, in force July 1, 1887, be and are hereby amended to read as follows:

SECTION 1. The owner, operator or superintendent of any coal mine shall make or cause to be made an accurate map or plan of such mine, which shall exhibit all the openings and excavations, the shafts, slopes or tunnels, the entries, rooms and breakthroughs; and shall show the direction of the air currents therein, and accurately delineate the surface section lines of the coal lands controlled by the owner of said mine, and show the exact relation to and proximity of the workings of said mine to said surface line. Said map or plan shall also show the exact date of each survey made, and indicate the boundary line of the most advanced face of the workings at each such date; and in case more than one seam of coal is opened or worked, a separate map or plan as aforesaid shall, if desired by the inspector, be made of the workings in each such seam. The said map or plan or a true copy thereof, with a record of all the surveys of said boundary lines and underground workings, shall be delivered by said owner, operator or superintendent to the state inspector of mines, for the district in which said mine is located, to be filed in his office; and the original or a true copy of the same shall be retained for reference and inspection at the office of said coal mine. The maps and plans so delivered to the inspector of mines, as aforesaid, shall be the property of the State, and shall remain in the care and custody of said inspector during his term of office, and be transferred by him to his successor in office. Maps of mines filed with the inspector shall be open to the examination of the public, in the presence of the inspector, but in no case shall any copy of the same be made without the consent of the owner, operator or his agent.

The maps or plans herein provided for shall be made during the month of July next succeeding the passage of this act, and thereafter in July of each and every year the owner, agent or operator of every coal mine shall cause surveys to be made of all alterations and extensions of the workings made during the year preceding, and shall have the record and results of said survey duly entered upon the map of the inspector and upon that kept at the mine. The said extensions shall be placed on the inspector's map, and the map shall be returned to the inspector within thirty days from the completion of the survey.

When any coal mine is worked out and is about to be abandoned, the owner, operator or superintendent shall have the maps or plans thereof extended to include all the excavations made, showing the most advanced workings of every part of the mine, and the relation of such boundaries to given boundaries on the surface.

SEC. 2. Whenever the owner, operator or superintendent of any coal mine shall neglect or refuse, or, from any cause not satisfactory to the mine inspector, fail, for the period of three months, to furnish to the inspector the map or plan of such coal mine, or of the extensions thereto, as provided for in this act, the inspector is hereby authorized to make, or cause to be made, an accurate map or plan of such coal mine, at the expense of the owner thereof, and the cost thereof may be recovered by law, from said owner, operator or

agent, in the same manner as other debts, by suit in the name of the inspector and for his use.

SEC. 3. For all coal mines in this State, when more than six men are employed, whether worked by shaft, slope or drift, there shall be provided and maintained, in addition to the hoisting shaft or opening, a separate escapement shaft or opening to the surface or an underground communication between every such mine and some other contiguous mine, such as shall be approved by the mine inspector as coming within the requirements of this act, and such as shall constitute two distinct and available means of ingress and egress to all persons employed in such coal mines. Such escapement shaft or communication with a contiguous mine, as aforesaid, shall be constructed in connection with every vein or stratum of coal worked in such mine; and all passage ways communicating with the escapement shafts or places of exit from main hauling ways to the escapement shaft shall be at least five feet wide and five feet high. Every escapement shaft shall be separated from the main shaft by such extent of natural strata as shall secure safety to the men employed in such mines; and before any escapement shaft shall be located, or the excavations for it be begun, the district inspector of mines shall be duly notified to appear and determine what shall be a suitable distance for the same; the distance from main shafts for such escapement shaft shall not be less than 300 feet, without the consent of the mine inspector, nor more than 300 feet without the consent of the operator. Such escapement shafts as shall be equipped after the passage of this act, shall be supplied with stairways, partitioned off from the main air way and having substantial handrails and platforms, and such stairways shall be at an angle not greater than forty-five degrees: Provided, that in mines more than one hundred feet in depth there shall be substituted for such stairways a suitable cage, suspended between guide rails and operated by such hoisting apparatus as shall, in the judgment of the inspector of mines, insure the safe and speedy removal of all persons within the mine in case of danger. No accumulation of ice shall be permitted in any escapement shaft, nor any obstructions to travel upon any stairways or ladders. The time which shall be allowed for completing such escapement shaft or making such communication with an adjacent mine, as is required by the terms of this act, shall be for mines already opened or in process of development when this act shall become a law, one year for sinking any shaft two hundred feet or less in depth, and one additional year, or pro rata portion thereof, for every additional two hundred feet or fraction thereof; but for mines which shall be opened after the passage of this act, the time allowed shall be two years for all shafts more than two hundred feet in depth, and one year for all shafts two hundred feet in depth or less; and the time shall be reckoned, in all cases, from the date on which coal is first hoisted from the original shaft for sale or use; and it shall be the duty of the inspectors of mines to see that all escapement shafts are begun in time to secure their completion within the time herein specified. In all cases where the working face of one mine has, by the agreement of adjacent owners, been driven into the workings of another mine, the respective owners of such mine, while operating the same, shall keep open a roadway at least five feet wide and five feet high, thereby forming a communication, as contemplated in this act, and in no case shall the workings of any mine be driven closer than ten feet to the line of land of any adjacent owner, without the written consent of such owner. And in all cases where the shaft of one mine has been used, or may be hereafter used, as an air or escapement shaft for another mine, neither owner or operator shall close or obstruct his shaft or workings so as to prevent the use of the same as an escapement or air shaft, without first giving one year's notice, in writing, to the other operator or owner, of his intention to abandon his mine;

but the operator continuing the work of his mine shall be at the expense of keeping abandoned workings in repair.

SEC. 4. The owner, agent or operator of every coal mine, whether operated by shaft, slope or drift, shall provide and maintain for every such mine a good and sufficient amount of ventilation for such men and animals as may be employed therein, the amount of air in circulation to be in no case less than one hundred cubic feet for each man and six hundred cubic feet for each animal, per minute, measured at the foot of the downcast, and the same to be increased at the discretion of the inspector according to the character and extent of the workings or to the amount of powder used in blasting; and said volume of air shall be forced and circulated to the face of every working place throughout the mine, so that such mine shall be free from standing powder smoke and gases of every kind. All doors set on main entries for the purpose of conducting the ventilation, shall be so constructed and hung as to close of themselves when opened, and shall be made sufficiently tight to effectually obstruct the air currents. In all the larger mines a boy or trapper shall be kept in attendance upon such doors to see that they are kept securely closed, and the air currents properly controlled. Whenever the inspector shall find men working without sufficient air, or under any unsafe conditions, he shall first give the operator a reasonable notice to rectify the same, and upon his refusal so to do may himself order them out until said portions of said mine shall be put in proper condition. All mines in which men are employed shall be examined every morning by a duly authorized agent of the proprietor, to determine whether there are any dangerous accumulations of gas, or lack of proper ventilation or obstructions to roadways, or any other dangerous conditions, and no person shall be allowed to enter the mine until such examiner shall have reported all the conditions safe for beginning work. Such examiner shall make a daily record of the condition of the mine in a book kept for that purpose, which shall be open at all times to the examination of the inspector. The currents of air in mines shall be so split as to give a separate current to at least every one hundred men at work, and inspectors shall have discretion to order a separate current for a smaller number of men if special conditions render it necessary. In case the galleries, roadways or entries of any mine are so dry as to become filled with dust, the operators of such mines shall be required to have such roadways regularly and thoroughly sprinkled; and it shall be the duty of the inspector to see that in all mines every practicable precaution shall be taken against accidents from the careless handling of powder within the mine, and in no case shall more powder be stored in the mine, at any one time, than in the discretion of the inspector is necessary for each day's use. It shall be unlawful for coal miners, in any mine, to charge a blasting hole with loose powder, or otherwise, than with a properly constructed cartridge; and in dry and dusty mines, it shall be unlawful to load cartridges in the mines except with a powder can constructed for the purpose.

It shall be unlawful for the owner, agent or operator of any mine to permit miners to work in said mine with tools prohibited by law.

It shall be unlawful for any operator or agent of a coal mine to employ persons underground whose duties may involve contact with inflammable gases, or the handling of explosives, who have not had experience in such duties, unless all such employees are placed under the immediate charge and instruction of such a number of competent men as to secure the safety of other persons employed in the same mine. The ventilation required by this section may be produced by any suitable appliances, but in case a furnace shall be used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works, by lining up from said furnace. Pro-

vided, it shall not be lawful to use a furnace for ventilating purposes, or for any other purpose, that shall emit smoke into any compartment constructed in, or adjoining any hoisting shaft or slope, where the hoisting shaft or slope is the only means provided for the ingress or egress of persons employed in said coal mines. It shall be unlawful where there is but one means of ingress and egress provided at a coal shaft or slope, to construct and use a ventilating furnace that shall emit smoke into a shaft, as an upcast, where the shaft or slope used as a means of ingress and egress by persons employed in said coal mines is the only means provided for furnishing air to persons employed therein.

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SEC. 8. All boilers used in generating steam in and about coal mines shall be kept in good order, and the agent, owner or operator as aforesaid shall have said boilers examined and inspected by a competent boiler-maker or other qualified person as often as once every six months, and oftener if the inspector shall deem it necessary; and the result of every such examination shall be certified in writing to the mine inspector.

The top of each and every shaft, and the entrance to each and every intermediate working vein shall be securely fenced by gates properly protecting such shaft and the entrance thereto; and the entrance to every abandoned slope, air or other shaft shall be securely fenced off; and every steam boiler shall be provided with a proper steam gauge, water gauge and safety valve.

All underground, self-acting or engine planes with single tracks on which coal cars are drawn and persons travel shall be provided with some proper means of signaling between the stopping places and the ends of said planes, and sufficient places of refuge at the sides of such planes shall be provided at intervals of not more than ten yards, and all other single planes or gangways twenty yards, and they shall not be less than six feet wide and six feet in depth, and shall be whitewashed or otherwise distinguished from the surrounding walls.

The bottom of every shaft shall be supplied with a traveling way to enable men to pass from one side of the shaft to the other without passing under or over the cages. All sumps shall be securely planked over so as to prevent accidents to men.

APPOINTMENT AND DUTIES OF INSPECTORS—SIXTH AMENDATORY ACT, 1895.

LAW 1895, P. 252.

JUNE 18, 1895.

AN ACT to amend section eleven (11) of an act entitled, "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended by an act approved June 18, 1883, and an act approved June 30, 1885, and to repeal section two (2) of an act entitled, "An act to require inspectors of mines to furnish information to the State Geologist and to provide for paying the expenses of the same," approved June 18, 1891.

SECTION 1. Be it enacted, etc.: That section eleven (11) of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879, as amended by an act approved June 18, 1883, and an act approved June 30, 1885, and now in force as so amended, be and the same is hereby amended so as to read as follows:

SEC. 11a. This State shall be divided into seven inspection districts, as follows: The first district shall be composed of the counties of Boone, McHenry, Lake, DeKalb, Kane, DuPage, Cook, LaSalle, Kendall, Grundy, Will, Livingston and Kankakee. The second district, the counties of Jo Daviess, Stephenson, Winnebago, Carroll, Ogle, Whiteside, Lee, Rock Island, Henry, Bureau, Mercer, Stark, Putnam, Marshall, Peoria and Woodford. The third district, the counties

of Henderson, Warren, Knox, Hancock, McDenough, Schuyler, Fulton, Adams and Brown. The fourth district, the counties of Tazewell, McLean, Ford, Iroquois, Vermilion, Champaign, Piatt, DeWitt, Macon, Logan, Menard, Mason and Cass. The fifth district, the counties of Pike, Scott, Morgan, Sangamon, Christian, Shelby, Moultrie, Douglas, Coles, Cumberland, Clark, Edgar, Montgomery, Macoupin, Greene, Jersey and Calhoun. The sixth district, the counties of Monroe, St. Clair, Madison, Bond, Clinton, Fayette, Marion, Effingham, Clay, Jasper, Richland, Crawford and Lawrence. The seventh district, the counties of Washington, Jefferson, Wayne, Edwards, Wabash, White, Hamilton, Franklin, Perry, Randolph, Jackson, Williamson, Saline, Gallatin, Hardin, Pope, Johnson, Massac, Union, Alexander and Pulaski.

b. The Governor shall upon the recommendation of a board of examiners selected for that purpose, composed of two practical coal miners, two coal operators, and one mining engineer, to be appointed by the Bureau of Labor Statistics of this State, all of whom shall be sworn to a faithful discharge of their duties, appoint seven properly qualified persons to fill the offices of inspectors of coal mines of this State (being one inspector for each district provided for in this act), whose commissions shall be for the term of two years, but they shall at all times be subject to removal from office for neglect of duty or malfeasance in the discharge of duty, as hereinafter provided for.

c. The inspectors so appointed shall have attained the age of thirty years, be citizens of this State, and have a knowledge of mining engineering sufficient to conduct the development of coal mines, and a practical knowledge of the methods of conducting mining for coal in the presence of explosive gases, and of the proper ventilation of coal mines. They shall have had a practical mining experience of ten years, and shall not be interested as owner, operator, stockholder, superintendent or mining engineer of any coal mine during their term of office, and shall be of good moral character and temperate habits, and shall not be guilty of any act tending to the injury of miners or operators of mines during their term of office. They shall provide themselves with the most approved modern instruments for carrying out the intention of this act. The inspectors, before assuming the duties of their several offices, shall take an oath of office, as provided for by the Constitution, and shall be required to enter into a bond to the State in the sum of five thousand dollars (\$5,000) with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular, as required by this act, said bond, with the approval of the Governor endorsed thereon, together with the oath of office shall be deposited with the Secretary of State.

d. Any person, company or corporation operating any coal mine in this State shall be required to pay an inspection fee of not less than six dollars nor more than ten dollars for each visit of inspection or investigation of a coal mine by a State Mine Inspector, such fee to be regulated by the class of the mine, which shall be fixed by the inspector and depend upon the length of time consumed, and the expense necessarily incurred in the inspection of such mine, and such fees shall be paid quarterly by the person, company or corporation operating the mine inspected to the secretary of the Bureau of Labor Statistics and by him covered into the State treasury, to be held as a fund for the payment of salaries of State Mine Inspectors, as herein provided. It shall be the duty of each inspector, as often as he may deem necessary and proper, and at least four times a year, to inspect each and every mine in his inspection district. Each inspection shall be certified to by the pit committee and mine manager of said mine. It shall be the duty of each inspector to keep a detailed record of all inspections and of all fees for such inspections, and he shall file a copy of the same with the secretary of the State Bureau of

Labor Statistics quarterly, between the first and fifteenth days of the following months: October, January, April and July, which reports shall be published annually as a part of the regular report of the State Bureau of Labor Statistics. The inspectors provided for in this act shall receive as full compensation for their services the sum of eighteen hundred dollars each per annum, to be paid quarterly out of such fund in the state treasury as may be received for inspection fees: Provided, however, that in the event of such fees being inadequate to compensate the inspectors in the amount provided herein, the deficiency in the salaries shall be paid out of any moneys in the State treasury not otherwise appropriated. The mine inspector shall be required to post up in some conspicuous place, at the top of each mine visited and inspected by him, a plain statement of the condition of said mine, showing what, in his judgment, is necessary for the better protection of the lives and health of persons employed in said mine; such statement shall give the date of inspection and the number of hours spent in the inspection, also the date of the latest previous inspection, and shall be signed, by the inspector and the check weighman, and, if there be no check-weighman employed by the miners, then said statement shall be signed by the weighman at the mine: Provided, that county boards may appoint an assistant county inspector in counties producing eight hundred thousand tons of coal or more per annum, upon the written request of the district mine inspector, who shall act under the direction of the district inspector and shall receive not less than three dollars nor more than five dollars per day for time actually employed, to be paid out of the county treasury; such assistant inspector shall be one who has received a mine manager's certificate for (from) the Board of Mine Examiners of this State.

e. It shall be unlawful for any person, company or corporation to operate any coal mine in this State without first having complied with all the conditions and sanitary regulations required under existing laws and paying all inspection fees provided for in this section, and in case of the refusal of any person, company, corporation, owner, agent or operator to pay said inspection fees, after assuming to operate a coal mine, it shall be the duty of the mine inspector in said district, through the State's Attorney of the county, or any other attorney, in case of his refusal promptly to act, to proceed on behalf of the State against said person, company, corporation, owner, agent or operator of said mine, by injunction, without bond, to restrain said person, company, corporation, owner, agent or operator from continuing or attempting to continue to operate said mine or carry on a mining business.

f. Section 2 of an act entitled "An act to require inspectors of mines to furnish information to State geologists, and to provide for paying the expenses of the same," approved June 18, 1891, be and the same is hereby repealed.

SEVENTH AMENDATORY ACT, 1895.

LAW 1895, P. 255.

JUNE 21, 1895.

AN ACT to amend section 4 of an act entitled "An act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 4 of an act entitled "An act providing for the health and safety of persons employed in coal mines," approved May 28, 1879, in force July 1, 1879; as amended by acts approved June 18, 1883, and June 21, 1883, in force July 1, 1883; as amended by an act approved June 30, 1885, in force July 1, 1885; as amended by an act approved June 16, 1887, in force July 1, 1887, and as amended by an act approved June 4, 1889, in force July 1, 1889, be amended so as to read as follows, viz:

SEC. 4. The owner, agent or operator of every coal mine, whether operated by shaft, slope or drift, shall provide and maintain for every such mine a good and sufficient amount of ventilation for such men and animals as may be employed therein, the amount of air in circulation to be in no case less than one hundred cubic feet for each man and six hundred cubic feet for each animal, per minute, measured at the foot of the downcast, and the same to be increased at the discretion of the inspector according to the character and extent of the workings, or to the amount of powder used in blasting, and said volume of air shall be forced and circulated to the face of every working place throughout the mine, so that such mine shall be free from standing powder smoke and impure gases of every kind. All doors set on main entries for the purpose of conducting the ventilation, shall be so constructed and hung as to close of themselves when opened, and shall be made sufficiently tight to effectually obstruct the air currents. In all the larger mines a boy or trapper shall be kept in attendance upon such doors, to see that they are kept securely closed, and the air currents properly controlled. Whenever the inspector shall find men working without sufficient air, or under any unsafe conditions, he shall first give the operator a reasonable notice to rectify the same, and upon his refusal or neglect so to do, may himself order them out until said portions of said mine shall be put in proper condition. All mines in which men are employed shall be examined every morning by a duly authorized agent of the proprietor, to determine whether there are any dangerous accumulations of gas, or lack of proper ventilation, or obstructions to roadways, or any other dangerous conditions, and no person shall be allowed to enter the mine until such examiner shall have reported all of the conditions safe for beginning work. Such examiner shall make a daily record of the condition of the mine in a book kept for that purpose, which shall be accessible at all times for examination by the men employed in and about the mine and by the inspector. The currents of air in mines shall be so split as to give a separate current to at least every one hundred (100) men at work, and the inspector shall have discretion to order a separate current for a smaller number of men if special conditions render it necessary. In case the galleries, roadways or entries of any mine are so dry as to become filled with dust, the operators of such mines shall be required to have such roadways regularly and thoroughly sprinkled, and it shall be the duty of the inspector to see that in all mines every practicable precaution shall be taken against accidents from the careless handling of powder within the mine, and in no case shall more powder be stored in the mine, at any one time, than in the discretion of the inspector is necessary for each day's use. It shall be unlawful for coal miners in any mine to charge a blasting hole with loose powder, or otherwise than with a properly constructed cartridge, and in dry and dusty mines to load cartridges except with a powder can constructed for the purpose, nor shall any miner fill a cartridge from a keg or powder can or handle loose powder in any manner whatever with his lamp in line with the air current passing the powder, nor shall his lamp be less than three feet horizontally from the powder that he is handling. Every miner about to fire a shot shall, before firing, see that all other persons are out of danger from the probable effects of such shot, and shall take means to prevent any person approaching the place until such shot has exploded and immediately before firing shall shout "fire." No person shall return to a missed shot within fifteen (15) minutes, unless the firing is done by electricity, and then only when the wires are disconnected from the battery; nor shall a second shot be fired in a working place where the roof is broken or faulty until the smoke from the previous shot has cleared away and the roof been examined. It shall be un-

lawful for the owner, agent or operator of any mine to permit miners to work in said mines with tools prohibited by law. It shall be unlawful for any operator or agent of a coal mine to employ persons underground, whose duties may involve contact with inflammable gases or the handling of explosives, who have not had experience in such duties, unless all such employees are placed under the immediate charge and instruction of such a number of competent men as to secure the safety of other persons employed in the same mine. The ventilation required by this section may be produced by any suitable appliances, but in case a furnace shall be used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works by lining the upcast with incombustible material for a sufficient distance up from said furnace: Provided, that it shall not be lawful to use a furnace for ventilating purposes or for any other purpose, that shall emit smoke into any compartment constructed in or adjoining any hoisting shaft or slope where the hoisting shaft or slope is the only means provided for the ingress and egress of persons employed in said coal mines. It shall be unlawful, where there is but one means of ingress and egress provided at a coal shaft or slope, to construct and use a ventilating furnace that shall emit smoke into a shaft as an upcast, where the shaft or slope used as a means of ingress and egress by persons employed in said coal mines is the only means provided for furnishing air to persons employed therein.

EIGHTH AMENDATORY ACT, 1897.

LAWS 1897, P. 389.

JUNE 7, 1897.

AN ACT to amend section 11e of an act entitled "An act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 11e of the amended act of 1895, entitled "An act to amend section 11 of an act entitled 'An act providing for the health and safety of persons employed in coal mines,' approved May 28, 1879, in force July 1, 1879, as amended by an act approved July (June) 18, 1883, and an act approved June 30, 1885, and to repeal section 2 of an act entitled 'An act to require inspectors of mines to furnish information to the State geologist and to provide for paying the expenses of the same,' approved June 18, 1891, approved June 15, 1895, in force July 1, 1895, be and the same is hereby amended so as to read as follows:

SEC. 11e. It shall be unlawful for any person, company or corporation to operate any coal mine in this State, where more than five men are employed at any one time, without first having complied with all the conditions and sanitary regulations required under existing laws, and paying all inspection fees provided for in this section, and in case of the refusal of any person, company, corporation, owner, agent or operator to pay said inspection fees, after assuming to operate a coal mine, it shall be the duty of the mine inspector in said district, through the State's Attorney of the county or any other attorney, in case of his refusal promptly to act, to proceed on behalf of the State against such person, company, corporation, owner, agent or operator of said mine by injunction, without bond, to restrain said person, company, corporation, owner, agent or operator from continuing, or attempting to continue to operate said mine or carry on a mining business.

NOTE.—These amendatory acts, after the first one, profess to amend sections of the original act that had previously been amended. Under a well-known rule an act or a section of an act that has been amended becomes wholly inoperative and stands as if it had never been enacted and can not again be amended. The validity of these subsequent amendatory acts depends on whether the recital and reference in the title to the original act and the prior amendments are sufficient to save them from the operation of the general rule.

ANNOTATIONS.

NOTE.—These annotations cover the statute of 1879, and the several amendments up to and including the amendatory act of 1897.

1. CONSTITUTION REQUIRES SAFETY STATUTES.
2. CONSTITUTIONALITY OF STATUTE—CLASSIFICATION.
3. CONSTRUCTION, PURPOSE, AND ENFORCEMENT OF STATUTES.
4. COAL MINING—POLICE POWER—INSPECTION FEES.
5. CARE REQUIRED OF OPERATOR—SAFE PLACES—MINER'S WORKING PLACE.
6. INSPECTION—DUTY TO EXAMINE AND MAKE REPORT—COMPLIANCE.
7. INSPECTION—NUMBER—DISCRETION OF INSPECTORS—FEES.
8. REPORT OF MINE EXAMINER—SUFFICIENCY.
9. ESCAPEMENT SHAFT—REQUIREMENT—WHAT CONSTITUTES.
10. LIGHTS AND GATES AT SHAFTS—FAILURE TO PROVIDE.
11. ROADWAY—MEANING AND PROOF.
12. DUTY AS TO HAULAGE WAYS.
13. EMPLOYMENT OF ENGINEER—COMPETENCY—QUESTION OF FACT.
14. PROPS—DUTY OF OPERATOR TO FURNISH.
15. PROPS—MINER'S DUTY AS TO HIS WORKING PLACE.
16. REQUIREMENTS OF TOP MAN AND BOTTOM MAN.
17. NOTICE OF NONOBSERVANCE OF STATUTE—DUTY.
18. WILFUL FAILURE TO COMPLY WITH STATUTE—QUESTION OF FACT.
19. WILFUL VIOLATION OF STATUTE—WHAT CONSTITUTES—PROXIMATE CAUSE.
20. WILFUL VIOLATION OF STATUTE—QUESTION OF FACT—PROOF.
21. NEGLIGENCE OF OPERATOR—CARE EXERCISED BY MINER.
22. CARE REQUIRED OF MINER.
23. MINER MAY ASSUME OPERATOR HAS COMPLIED WITH STATUTE.
24. CONTRIBUTORY NEGLIGENCE OF MINER.
25. ASSUMPTION OF RISK—KNOWLEDGE OF DANGER.
26. STATUTE NOT ABROGATED BY CONTRACT.
27. VICE PRINCIPAL OR AGENT—DUTIES—RIGHT TO RECOVER.
28. ACTION FOR DEATH—WHO MAY SUE—SINGLE RECOVERY.
29. PURPOSE OF SURVEY.
30. MINING UNDER SURFACE—DAMAGES.
31. REPEALING EFFECT.

1. CONSTITUTION REQUIRES SAFETY STATUTES.

This act and the act of 1887 (Laws of 1887, p. 235), of which it is amendatory, were enacted pursuant to the mandatory requirements of the constitution and are of the gravest import and of the highest character and must be construed in connection with the constitutional provision requiring the enactments. (Constitution, art. 4, sec. 29.) The constitution requires that legislation shall be had for the purpose of protecting the large number of persons engaged in coal mining in the State and recognizes that the business of coal mining is attended with unusual hazards and dangers. In the construction and equipment of mines this statute requires the discharge of specific duties, so that the utmost safety can be extended to the miners, and it seeks to meet the requirement of the constitution and directs the owner, operator, or manager of a coal mine to make provisions for the safety of the miners employed within the mines.

Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 501;
 Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 523;
 Carterville Coal Co. v. Abbott, 81 Ill. App. 279, affirmed.

2. CONSTITUTIONALITY OF STATUTE—CLASSIFICATION.

This statute is not unconstitutional because it fails to provide for a stated number of inspections or because it fails to fix a reasonable number of annual inspections with some reasonable basis for the fees to be charged, but leaves inspections to be made at the option of inspectors with fees for possible useless inspections to be charged to the owner or operator. Any limitation on the number of inspections regardless of circumstances or dependent solely on the number of men employed or the size or shape of the mine or other circumstances that might arise would fritter away the benefits to be derived from the act and create a condition that might be productive of danger to the safety of the mine and to the lives of the miners. The dipping of a fissure by which gas may enter a mine, the gathering of foul air in certain rooms from unknown gases, or the dangerous condition of the roof may necessitate frequent inspections in the interest of safety to the mine and miners, which, in the absence of these inspections, would not be necessary. Such gaseous conditions can not be foreseen, but may result from an expansion of the work in the mine, from an explosion in the ordinary blasting of coal, or from other causes in the necessary manner of working a mine. When such conditions exist frequent inspection is necessary and an attempt on the part of the legislature to lay down a rule by fixing a given number of inspections would defeat the constitutional requirement of proper protection of operative miners.

Consolidated Coal Co. v. People, 186 Ill. 134, p. 138.

The act of 1897 amended the former law of 1895 by limiting its application to coal mines "where more than five men are employed at any one time." This is a species of classification which a legislature is at liberty to adopt providing that it be not wholly arbitrary or unreasonable.

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 207.

This act itself furnishes no basis for a classification as to the number of inspections and as to the price charged in each case, except that it provides that no inspection shall be required unless five operatives are employed at the same time, that at least four inspections shall be made each year, and that fees shall be dependent upon the length of time consumed and the expenses necessarily incurred in the inspection of such mine. So many elements enter into the classification as to make it impossible to seize upon one or two and make them the only basis and the act is not necessarily violative of the federal constitution from the fact that some discretion is allowed to the inspector in determining the number of times the mine shall be inspected and the fee fixed therefor, especially where no complaint is made of the abuse of such discretion, or that an inspector has been "guilty of any act tending to the injury of miners or operators of mines during their term of office."

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 209.

3. CONSTRUCTION, PURPOSE, AND ENFORCEMENT OF STATUTES.

This act and the amendments thereto require certain specified duties to be done by the owner, operator or manager of a coal mine. The object of the statute is the protection of miners working in coal mines and the act is an effort on the part of the general assembly to comply with the constitution by providing for ventilation of mines, the construction of escapement shafts and such other appliances as shall secure safety in all coal mines, and it is within the power of the legislature to require the preparation of maps and to cause them to be filed with the chief mine inspector of the district.

Chicago, etc., Coal Co. v. People, 181 Ill. 270, p. 273;

Consolidated Coal Co. v. People, 186 Ill. 134, p. 135.

See Daniels v. Hylard, 77 Ill. 640.

The purpose of the statute is in regard to the health and safety of the miners and requires that mine owners shall permit an inspection of their mines for this purpose and is an exercise of police power and is not in violation of the constitution, nor is the requirement that the fees of the inspector shall be paid by the mine owner or operator.

Chicago, etc., Coal Co. v. People, 181 Ill. 270, p. 275;
Consolidated Coal Co. v. People, 186 Ill. 134, p. 137.

This law was not enacted for the benefit of the owner of a mine but to protect the health and insure the safety of the persons employed in the mines.

Loose v. People, 11 Ill. App. 445, p. 447.

The act of 1897 does not in terms declare that the act of 1895 shall only apply to coal mines where more than five men are employed at any one time but it merely exempted the owners of such mines from punishment for violations of the general law.

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 207.

4. COAL MINING—POLICE POWER—INSPECTION FEES.

The mining of coal is recognized as a dangerous and hazardous business and is a productive industry of the greatest importance. Many thousands of men are and have been engaged in this character of work and the proper safeguarding of their lives and health is a matter of so great interest and necessity that no subject can be mentioned where there is more positive necessity for the exercise of the police power than in seeking to subserve their safety. Under this police power the legislature has the right to provide for the inspection of mines and it may under the same power also provide for the payment of fees for such inspection and may place the burden of the payment of such fees on the business that requires the employment of men in such dangerous and hazardous work.

Chicago, etc., Coal Co. v. People, 181 Ill. 270, p. 276.

Inspection fees are not taxes but are imposed under the principle that they are compensation for services rendered in and about making such inspection, which is presumably beneficial to the person upon whom the fees are imposed under and by virtue of the general police powers of the State. On this theory the legislature has power to require a mine operator to pay the fees of the State mine inspector.

Chicago, etc., Coal Co. v. People, 181 Ill. 270, p. 275;
Consolidated Coal Co. v. People, 186 Ill. 134, p. 137.

Section 11 of this act was amended by the act of 1895 (Laws 1895, p. 252), and by the act of 1897 (Laws 1897, p. 269). These amendatory acts provide that the fees of mine inspectors shall be paid by the mine owner or operator. The provision with reference to the appointment of inspector for coal mines who are to discharge duties imposed upon them is a proper exercise of the police power of the State.

Chicago, etc., Coal Co. v. People, 181 Ill. 270, p. 275;
Consolidated Coal Co. v. People, 186 Ill. 134, p. 137.

The regulation of mines and miners, their hours of labor and the precaution that shall be taken to insure their safety, health and comfort are obviously within the police powers of the several States.

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 207.

A State may appoint mining inspectors and provide for their payment by the owners of mines.

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 207.

5. CARE REQUIRED OF OPERATOR—SAFE PLACES—MINER'S WORKING PLACE.

When a coal mine operator provides a place in which the miner is to work the law does not make him a guarantor of its safety, but requires of him only the exercise of reasonable or ordinary care to have and keep it reasonably fit for the use to which it is put.

Consolidated Coal Co. v. Scheller, 42 Ill. App. 619, p. 624, 636.

See Quincy Coal Co. v. Hood, 77 Ill. 68;

Consolidated Coal Co. v. Wombacher, 134 Ill. 57;

Troughgear v. Lower Vein Coal Co., 62 Iowa 576.

This statute names all the duties to be performed by a mine owner or operator that are necessary to be complied with for the proper and safe conducting of a dangerous business, but it does not impose upon such owner or operator the duty of propping the roof of a mine to keep it safe.

Consolidated Coal Co. v. Parson, 66 Ill. App. 434, p. 438;

Consolidated Coal Co. v. Scheller, 42 Ill. App. 635.

See Consolidated Coal Co. v. Yung, 24 Ill. App. 255;

Missouri & Ill. Coal Co. v. Schwalb, 77 Ill. App. 593.

This amendatory act makes it the duty of the owner or operator of every coal mine to fence the top of every shaft by gates properly protecting the entrance thereto.

Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 63.

Section 4 of this act was amended by section 18 of the act of April 18 of 1899 (Laws of 1899, p. 315) providing for the placing of a conspicuous mark on any dangerous condition found to exist as notice to miners to keep out.

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 522.

See Kellyville Coal Co. v. Strine, 117 Ill. App. 115.

The rule requiring a coal mine operator to use reasonable diligence to furnish a reasonably safe place for miners to work has no application to miners or other employees whose duties are to make dangerous places safe.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595;

Tygett v. Sunnyside Coal Co., 121 Ill. App. 77;

Orlea v. Bunsen Coal Co., 171 Ill. App. 175, p. 178.

6. INSPECTION—DUTY TO EXAMINE AND MAKE REPORT—COMPLIANCE.

The failure of a coal mine operator to cause the mine to be examined every morning with a safety lamp by a competent person, to ascertain if fire damp is present in the mine, does not render the operator liable for the death of a miner where gas was being generated at the bottom of a shaft and not at the "working place" where the accident occurred. It would have been of no use to examine the working place with a safety lamp in the morning, as the miners had worked at such working places with their open lamps some two or three hours before the accident occurred. This is sufficient to show that the failure to examine the place with a safety lamp in the morning in no manner contributed to the accident, and under the circumstances no good effect would have resulted from such an examination made in the morning.

Coal Run Coal Co. v. Jones, 127 Ill. 379, p. 382;

Coal Run Coal Co. v. Jones, 19 Ill. App. 365, reversed.

See Muddy Valley Min., etc., Co. v. Phillips, 39 Ill. App. 376, p. 380.

The failure of a mine operator to cause the working places in a mine to be examined with a safety lamp by a competent person every morning, cannot make the mine operator liable for the death of a miner caused by an explosion of gas in a shaft where the miners working in the shaft knew that gas was generated, and had made provisions for its escape or dilution by bringing air into the shaft by downcast and taking it out by upcast, and where the miner who was killed expressed his belief that there was not a dangerous accumulation of the gas below a certain scaffold or platform and where with knowledge of the presence of the gas the miner voluntarily went below the platform and where the miners cautioned each other not to get the lights down too low or to get them where the gas was, and where the explosion occurred when the miner tapped his lamp on the toe of his boot and brought the flames of the lamp in contact with the gas flowing upward from beneath the platform, resulting in an explosion which caused his death.

Coal Run Coal Co. v. Jones, 127 Ill. 379, p. 383;

Coal Run Coal Co. v. Jones, 19 Ill. App. 365, reversed.

See Muddy Valley Min., etc., Co. v. Phillips, 39 Ill. App. 376, p. 380.

The duties of a coal mine operator under this statute do not end with the making of the examination on each morning as required; but the law goes further and provides that no person should be permitted to enter the mine until the examiner has reported all the conditions safe for beginning work.

Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;

Pawnee Coal Co. v. Royce, 79 Ill. App. 460, reversed;

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248, p. 253.

7. INSPECTION—NUMBER—DISCRETION OF INSPECTORS—FEES.

Under section 11 of the act of 1879 one mine may be required to be inspected oftener than another depending largely upon the number of miners, the depths of their workings and the nature of the ground through which the excavations are made. While at a certain stage of excavation, the precautions imposed by a mining inspector may be quite adequate for the protection of the operatives, at another time the same precautions would be obviously unsafe, depending largely upon the rapidity with which the excavations were made and the changes of air observed as the excavations progress.

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 209.

In enacting a law with regard to the inspection of mines there is no objection in case the legislature finds it impractical to classify the mines for the purpose of inspection to commit that power to a body of experts who are not only experienced in the operation of mines, but are acquainted with the details necessary to be known to make a reasonable classification, although it may affect the amount of fees to be paid by the mine owners. The matter of the number of inspections could be intrusted to no one so safely as to the inspector of the district who is appointed with great care and who must be a man of mature age, a citizen of the State and having special knowledge of practical mining. The fact that the fees of the inspectors are not dependent upon the number of inspections shows that the inspector would gain nothing by multiplying the number of his visits or magnifying the amount of his fees.

St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203, p. 211.

The fact that the specified time or occasion when inspections are to be made is not limited does not give inspectors power to inspect daily and unnecessarily impose a burden by the imposition of inspection fees which would in effect destroy the business of the mine owner. The act requires that there must be

four inspections a year and imposes the duty on the inspectors to make the inspection as often as may be deemed necessary and proper, but they are made subject to removal for neglect of duty or malfeasance in the discharge of duty, and the statute provides that they shall not be guilty of any act done to the injury of miners or the operators of mines during their term of office. "An attempt to impose an unreasonable inspection would be an act tending to the injury of operators of mines, for which the terms of the act provide a means of prevention, and the law is not so powerless that it could not prevent extortions of this character."

Chicago, etc., Coal Co. v. People, 181 Ill. 270, p. 276;
Consolidated Coal Co. v. People, 186 Ill. 134, p. 138.

8. REPORT OF MINE EXAMINER—SUFFICIENCY.

The report of a mine examiner is insufficient where it does not state that all the conditions in the mine are safe for beginning work. And a miner is not required to look for the record and to ascertain for himself as to the contents of the report, but he has the right to assume that the operator would comply with the statutory requirements and not permit him or others to enter the mine until all the conditions are safe for beginning work.

Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;
Pawnee Coal Co. v. Royce, 79 Ill. App. 469, reversed.

The statute requires the mine operator to have an examination made each morning and a report made of every examination; but a printed report with a favorable statement as to the condition of the mine, giving the miner nothing to do but to date the report and sign it, while a technical compliance with the statute is not a method to be approved. The failure to state in such a report that all the conditions in the mine were safe is a violation of the statute.

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248, p. 252.

A daily report by an examiner made in a book containing printed blanks to the effect that he had examined the mine before the commencement of work therein and found the same "free from dangerous gases, the air currents circulating properly, and the entrance in a safe condition," is not a sufficient compliance with the statute, as it fails to report that all the conditions concerning which the statute requires an examination and report to be made were safe for beginning work.

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248, p. 252.

9. ESCAPEMENT SHAFT—REQUIREMENT—WHAT CONSTITUTES.

By section 3 of the Amendatory Acts of 1887 and 1889 a coal mine operator employing more than 6 men is required to construct escapement shafts equipped with stairways at an angle of not more than 45 degrees, partitioned off from the main airway with substantial handrails and platforms.

Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 501.

When it is made to appear that a mine is being operated without an escapement shaft, contrary to law, and is dangerous to the persons engaged in working the same, the statute requires the court to make an order prohibiting the further working of a mine until the same shall have been made safe and the provisions of the statute complied with. A court can not in such a case undertake by its decree to settle conflicting rights of mine owners.

Loose v. People, 11 Ill. App. 445, p. 449.

A pit or hole intended to be used when completed as a shaft of a coal mine, but where no coal has been reached or mined, can not be held as a matter of law to be a shaft of a coal mine within the meaning of this statute; but it is a question of fact whether such pit or hole was a coal mine. The test of the applicability of the statute is not the depth of the pit or hole nor the peril of one engaged in sinking it, but whether it is the shaft of a coal mine.

Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 66.

See *Catlett v. Young*, 143 Ill. 74;

Cox v. Mount Olive & Staunton Coal Co., 127 Ill. App. 24, p. 25;

Moore v. Dering Coal Co., 147 Ill. App. 95, p. 98.

The owner of a coal mine can not avoid the provisions of this statute as to the requirements of escapement shafts by claiming a right to connect his mine with an adjoining mine and use for his miners the escapement shaft in such adjoining mine, where there is no agreement to that effect with the adjoining mine owner and where such adjoining mine owner has the right at any time to close the opening between the two mines. But the conflicting rights of adjoining mine owners as to the common use of an escapement shaft can not, in any event, be litigated in a prosecution by the State against a mine owner for operating his mine without complying with the provisions of this act.

Loose v. People, 11 Ill. App. 445, p. 446.

The provisions of the statute as to fencing the top of shafts apply only to coal mines and do not apply to mines out of which are taken lead or other minerals or ores, nor to pits or excavations not parts of a coal mine. While all pits or holes made in the earth might be dangerous if unguarded, yet the legislature saw fit to limit the provisions of this statute to and made it the duty of the owner or operator of every mine, thereby limiting the statute to shafts used in a coal mine.

Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 66.

A mine operator whose coal mine was between 300 and 400 feet deep had three years in which to construct the required escapement shaft under the act of 1877; and to require an operator to be controlled by that act and to leave that law in force and effect, in so far as the matter was concerned, the legislature enacted the third section of the law of 1879 (Laws of 1879, p. 204) and added the proviso that nothing in the section should be construed to extend the time allowed by law for constructing escapement shafts. This proviso evidently referred to the act of 1877, as it was the only law on the subject then in force and the manifest intention was, when that law had fixed a time within which shafts should be constructed, not to interfere with that law so far as extending the time for such construction.

Hamilton v. State, 102 Ill. 367, p. 369.

A coal mine operator who willfully fails to securely fence the top of a shaft as required by this statute is liable for an injury or the death of a miner resulting from such failure to comply with the statute.

Catlett v. Young, 143 Ill. 74, p. 81;

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 41.

10. LIGHTS AND GATES AT SHAFTS—FAILURE TO PROVIDE.

Section 6 of the original act required among other things that a sufficient light should be furnished at the top and bottom of a shaft to insure as far as possible the safety of persons getting on or off the cage. A mine operator can not avoid the force of the statute in failing to keep a sufficient light by substituting a plan by ordering a servant to go to the landing with a lantern when the cages bring workmen from the mine to the surface of the ground in the

night time; and if the servant fails to be present when a cage is brought to the surface in the dark the operator will be liable for injuries sustained by a miner in alighting from the cage, though the immediate cause of the injury was the act of the miner in stepping from the car after it had passed the landing, as the existing condition of darkness must be taken as the proximate cause of the injury under the circumstances, and the mine owner or operator can not be heard to say, as against his violation of the statute, that the injured miner was guilty of contributory negligence.

Odin Coal Co. v. Denman, 185 Ill. 413, p. 419;
Eldorado Coal & Coke Co. v. Swan, 227 Ill. 586, p. 592;
Odin Coal Co. v. Denman, 84 Ill. App. 190.

Where a mine owner and operator failed securely to fence the top of the shaft by gates properly protecting the shaft as required by section 8, but substituted a different arrangement, so that cages of coal could be elevated above the top of the shaft to the tippie house, such owner and operator in an action for damages for injuries caused by the failure to securely fence the top of the shaft as required can not prove that he in good faith intended to comply with the provisions of the statute and that he did not intend by the substituted arrangements a willful or any violation of the statute, as there was no charge of evil or wrongful intent.

Odin Coal Co. v. Denman, 185 Ill. 413, p. 417;
Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41, p. 45;
Eldorado Coal & Coke v. Swan, 227 Ill. 586, p. 592;
Odin Coal Co. v. Denman, 84 Ill. App. 190.
 See *Hollingshead v. Wabash Coal Co.*, 142 Ill. App. 641, p. 644.

11. ROADWAY—MEANING AND PROOF.

A court may not assume that the term "roadway" as used in the statute means only the space between the rails or the space between the rails and a short distance on each side of the rails sufficient to allow the passage of coal cars, without reference to accumulations of dirt and stone or other obstructions in the entry on the outside of the rails. But where evidence is introduced to show that the roadway in a particular case was understood to be the entire width of an entry and the jury trying the case finds that the roadway was understood to be the entire entry, such finding is binding on the court and a mine operator will be held liable for damages for permitting obstructions to remain in the entry on the sides of the track, by reason of which a car driver was injured.

Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;
Pawnee Coal Co. v. Royce, 79 Ill. App. 469, reversed.

12. DUTY AS TO HAULAGE WAYS.

Section 8 applies to gangways or haulage ways in a mine where the cars are drawn by mules as well as to mines where the cars in such gangways or haulage ways are operated by machinery.

Sangamon Coal Min. Co. v. Wiggerhaus, 25 Ill. App. 77, p. 78.
Affirming Sangamon Coal Min. Co. v. Wiggerhaus, 122 Ill. 279.

A mine operator is liable in damages for an injury to a car driver caused by failure to provide the gangway or haulage way with proper means of signaling between the stopping places and for a failure to provide refuge holes in which a car driver could seek safety in case of a collision.

Sangamon Coal Co. v. Wiggerhaus, 25 Ill. App. 77, p. 78.

13. EMPLOYMENT OF ENGINEER—COMPETENCY—QUESTION OF FACT.

The duty of a mine operator as to the employment of an engineer under section 7 is substantially the same as that under the common law.

Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95, p. 97.

Under section 7, as under the common law, the question as to whether an engineer was incompetent and as to whether the mine operator knew or should have known of such incompetency, are question of fact for a jury to determine.

Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95, p. 97.

Affirming Niantic Coal Min. Co. v. Leonard, 126 Ill. 216.

A mine operator is liable in damages under section 7 for injuries to a miner caused by letting the cage down too rapidly, where the evidence shows that the engineer employed was not reasonably fit for the service and that the mine operator knew, or by use of ordinary care should have known, of such incompetency.

Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95, p. 98.

Affirming Niantic Coal Min. Co. v. Leonard, 126 Ill., p. 216.

14. PROPS—DUTY OF OPERATOR TO FURNISH.

It is as much the duty of the mine operator to furnish props of sufficient dimensions as it is to furnish props at all.

Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 95, p. 99.

This statutes makes it the duty of every owner or operator of a coal mine to keep a supply of timber constantly on hand of sufficient length and dimensions to be used as props and cap pieces and to deliver the same as required, with the miner's empty car, so that the miner may at all times be able to properly secure his workings for his own safety.

Mount Olive & Staunton Coal Co. v. Herbeck, 190 Ill. 39, p. 41;

Mount Olive & Staunton Coal Co. v. Herbeck, 92 Ill. App. 441;

Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 538, p. 543;

Kellyville Coal Co. v. Yehnka, 94 Ill. App. 74, p. 81.

To entitle an injured miner to recover for the alleged failure of the mine operator to furnish props the evidence must show that the operator willfully failed and neglected to deliver the props and caps of sufficient length and dimensions with which to prop the roof and that because of such willful failure and neglect the miner was injured.

Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 95, p. 96.

Where the evidence shows that for three consecutive days a miner's demand for props and caps was unheeded and the only excuse was that on one of such days the regular timberman was absent on account of sickness is sufficient to show a violation of the statute, especially where the mine operator had no regular mine examiner and the duty to examine the mine, as required by the statute, was habitually neglected.

Donk Bros. Coal & Coke Co. v. Peton, 95 Ill. App. 193, p. 196;

Kellyville Coal & Coke Co. v. Petraytis, 95 Ill. App. 635, p. 636.

When a miner makes a reasonable and timely demand for timbers for a particular and specified room to be used in propping the roof of his working place, the mine owner and operator should furnish him such timbers as he calls for. The practical miner at work in a given room whose life is at stake is quite as likely to call for the proper timber as the mine manager would be to furnish suitable props if the selection was left to his choice or convenience.

Springfield Mining Co. v. Gedutis, 227 Ill. 9, p. 12.

See Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271.

Where a timber boss knew for several days before a miner was injured that timbers for props and cap pieces were not furnished in the miner's room as required by the statute and as repeatedly requested by the miner during such

time, such knowledge and failure amount to a willful violation within the meaning of section 16.

Kellyville Coal Co. v. Yehnka, 94 Ill. App. 74, p. 80;

Odin Coal Co. v. Denman, 185 Ill. 413.

See Catlett v. Young, 143 Ill. 74.

By section 16 of this act a mine operator is required to supply props and cap pieces "so that the workmen may at all times be able to properly secure their workings for their own safety." But the amendatory act of 1899 requires mine operators to provide props, caps, and timbers "for the securing of the roof by miners," and the duty is imposed upon the miner to prop and secure his place. The uncertainty in this act is removed by clear and definite statements in the revision of 1899.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 242.

15. PROPS—MINER'S DUTY AS TO HIS WORKING PLACE.

Where timbermen are employed the miners are relieved of the duty and labor of setting props, but they are not thereby relieved of the duty of observing the conditions and promptly reporting to the mine manager or timbermen any signs of danger they may discover which require their services. Miners may be particularly charged with this duty by rules or notices by which it is expressly made the duty of every miner to examine the roof or top coal of his working place every morning, and if found unsafe to take it down immediately or prop up the loose material and see that it is in safe condition before commencing work.

Consolidated Coal Co. v. Scheller, 42 Ill. App. 619, p. 630, 635.

See Consolidated Coal Co. v. Yung, 24 Ill. App. 255, p. 256;

Consolidated Coal Co. v. Schieber, 65 Ill. App. 304, p. 309;

Consolidated Coal Co. v. Parson, 66 Ill. App. 434, p. 439.

A court may take judicial notice of the fact that veins of coal in a particular locality are overlaid immediately with a stratum of slate or rock, which constitute the roof, provided by nature, and under which the miners employed in the mine must work. The mine operator can not choose between the roof so provided and some other to be constructed by himself, and that is fully known to the miners there employed. The overlying stratum is not uniform in consistency, thickness, or strength, and to make it safe as a roof props and other artificial appliances are necessary. Miners become, by reason of experience and interest, competent, if not the best, judges of the character and condition of this natural roof at given places and of the extent to which it needs artificial support. Where no timbermen are employed it is the duty of miners as a part of their employment to carefully observe the roof under which they are working and to set props whenever they appear to be needed. This is implied by the statute which requires coal-mine operators to keep a supply of timbers on hand of the proper length and dimension and to deliver the same as required by the miners.

Consolidated Coal Co. v. Scheller, 42 Ill. App. 619, p. 629.

16. REQUIREMENTS OF TOP MAN AND BOTTOM MAN.

Section 6 of this act was superseded by sections 23 and 28 of the act of 1899, but the sense and meaning of the requirements that the top man and bottom man shall remain at their respective posts of duty has not been changed.

Thompson v. O'Gara Coal Co., 161 Ill. App. 39, p. 41.

17. NOTICE OF NONOBSERVANCE OF STATUTE—DUTY.

After notice is received by a coal-mine operator that one of the passage ways connecting with the escapement shaft or place of exit from the main hauling ways is not 5 feet in height, the operator is not entitled under the statute to a reasonable time within which to put such passage way in the condition required by the statute. But on receipt of such notice the operator should not allow anyone to work in the passage way at the place where it does not comply with the statute until a report of the mine examiner had been made showing that the passage way was in the condition required by law.

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248, p. 250.

18. WILLFUL FAILURE TO COMPLY WITH STATUTE—QUESTION OF FACT.

A conscious failure on the part of a mine operator to observe and comply with the provisions of the mine and miner's act, even though no evil intent induced the failure, is a willful violation of the statute. The question as to whether a willful violation of the statute was the proximate cause of an injury complained of is one of fact.

Athens Mining Co. v. Carnduff, 221 Ill. 354, p. 357.

Under section 14 the only cause of negligence upon which a recovery can be based are those specified in the section and these are willful violations of the act, or willful failures to comply with its provisions, and proof of a failure to comply with the provisions of the section in that the mine owner and operator failed to furnish the drum with a sufficient brake and that the failure so to do caused the death of a miner, damages for which the action was brought, is sufficient to create a liability under the statute.

Beard v. Skeldon, 13 Ill. App. 54, p. 62.

A miner injured by a prop or drill carried in a cage by him in violation of the statute can not recover for the injury occasioned directly by such violation on his part. But if the mine operator willfully and negligently failed to comply with the statute in properly equipping the cage or in failing to furnish an engineer reasonably fit for operating the engine and the cage, and the injury was caused principally and substantially by such failure, then the mine operator would be liable although the miner may have been negligent in carrying a prop or drill on the cage and such negligence may have in some degree contributed to the injury.

Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95, p. 96.

See Illinois Fuel Co. v. Parsons, 38 Ill. App. 182, p. 185;

Catlett v. Young, 38 Ill. App. 198.

When the mouth of a shaft is not protected in substantial compliance with the requirements of this act, the mine owner necessarily must be held to have willfully, or what is the same, knowingly, failed to comply with the law, and injury to person or property which is occasioned by such failure gives a right of action without reference to the caution or prudence of the person injured.

Catlett v. Young, 38 Ill. App. 198, p. 201.

See Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 68.

The failure of a mine operator to cause the mine to be examined as the statute requires is a wilful violation of the statute, and where the negligence of an operator is wilful, it is immaterial whether the miner was at the time he received the injury in the exercise of ordinary care.

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248, p. 253;
Spring Valley Coal Co. v. Rowatt, 196 Ill. 156;
Royce v. Pawnee Coal Co., 184 Ill. 482;
Athens Min. Co. v. Carnduff, 123 Ill. App. 178, p. 186.
See Cartersville Coal Co. v. Abbott, 181 Ill. 495, p. 502.

Section 14 of this act proceeds upon the theory that the violation or omission of duty must be wilful, and it is made the duty of an agent as well as the owner to place catches on the cages used for hoisting and lowering men, and the owner and agent are equally guilty of wilful omission of duty in failing to do so and are equally liable to prosecution in case of injury arising therefrom. The owner and an agent operating the mine with full authority and furnished with necessary means by the owner and having ample power to provide the appliances required would be equally liable in an action for damages resulting to a miner by reason of the failure to equip the hoisting cage with appliances required by this act. And there can be no recovery in an action for the death of the agent caused by his own neglect to furnish and equip the hoisting cage with the appliances as required by the statute.

Beaucoup Coal Co. v. Cooper, 12 Ill. App. 373, p. 337.

The design of the statute in requiring the drum to be supplied with a brake was to compel the furnishing of an appliance which would hold the cage securely while suspended in and over the shaft, and prevent it going down if the machinery for any reason should fail to sufficiently hold it, whether from the breaking or imperfection of some of its parts. A failure of the motive or the static power to hold it in equilibrium or from any other cause is a "giving-out" of the machinery within the meaning of the statute. And a failure to furnish the drum with a sufficient brake is a wilful violation of the act and renders the owner liable for the death of a miner caused by such wilful omission.

Beard v. Skeldon, 13 Ill. App. 54, p. 58;
Beard v. Skeldon, 113 Ill. 584, p. 587;
Illinois Third Vein Coal Co. v. Cioni, 215 Ill. 583, p. 588.

19. WILFUL VIOLATION OF STATUTE—WHAT CONSTITUTES—PROXIMATE CAUSE.

By this section the operator of a coal mine is made liable in damages for injury to person or property or for death of a miner occasioned by the wilful violation of any of the provisions of the act.

Cartersville Coal Co. v. Abbott, 181 Ill. 495, p. 501.

A coal-mine operator is charged with knowledge of the provisions of the statute and with the duty of complying therewith. But there is no evil intent operating to induce the failure to comply with the statute and that element is not a necessary ingredient of wilfulness within the meaning of the word wilful as used in this statute. As here used an act consciously omitted is wilfully omitted, in the meaning of the word wilful as used in this statute.

Odin Coal Co. v. Denman, 185 Ill. 413;
Donk Bros. Coal & Coke Co. v. Peton, 95 Ill. App. 193 p. 196.

An act consciously omitted is wilfully omitted in the meaning of the word "wilful" as used in this statute and all the statutes relative to the duties of mine owners and operators.

Odin Coal Co. v. Denman, 185 Ill. 413, p. 417;
 Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41, p. 44;
 Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 502;
 Catlett v. Young, 143 Ill. 74;
 Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 519;
 Marquette Third Vein Coal Co. v. Dielle, 208 Ill. 116-122;
 Kellyville Coal Co. v. Strine, 217 Ill. 516;
 Eldorado Coal & Coke Co. v. Swan, 227 Ill. 586, p. 590;
 Odin Coal Co. v. Denman, 84 Ill. App. 190.

An owner, operator, or manager who so constructs or equips his coal mine that he knowingly operates it without conforming to the provisions of the statute, wilfully disregards its provisions and wilfully disregards the safety of miners employed therein; and such owner, operator or manager who wilfully disregards a duty enjoined on him by the legislature and places in danger the lives and limbs of those employed therein, cannot be heard to say that because a miner enters a mine with knowledge that the owner or operator failed to comply with his duty he is guilty of contributory negligence. Likewise a miner using the means provided by the owner or operator for entering the shaft of his mine is not guilty of contributory negligence.

Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 501;
 Odin Coal Co. v. Denman, 185 Ill. 413, p. 418;
 Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41, p. 45;
 Spring Valley Coal Co. v. Bowatt, 196 Ill. 156, p. 160;
 Davis v. Illinois Collieries Co., 232 Ill. 284, p. 290;
 Willis Coal Co. v. Grizzell, 100 Ill. App. 480, p. 484;
 Sunnyside Coal Co. v. Center, 100 Ill. App. 546, p. 547;
 Kirchener v. School Creek Coal Co., 162 Ill. App. 52, p. 54.
 See Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;
 Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 523;
 Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 388;
 Kellyville Coal Co. v. Yehnika, 94. Ill. App. 74, p. 81.

A mine owner and operator who failed to partition the escapement shaft from the main air way in his mine and who failed to provide the stairway in the escapement shaft with substantial handrails and with a platform protected by railing as required, is liable to a person who while descending the stairway in connection with his duties in the mine was injured by falling from a platform, because of the failure of the operator to properly protect the platform.

Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 503;
 Carterville Coal Co. v. Abbott, 81 Ill. App. 279, Affirm.

20. WILFUL VIOLATION OF STATUTE—QUESTION OF FACT—PROOF.

In an action by a miner against a coal-mine operator for damages for injuries caused by an explosion due to alleged improper ventilation, the question, as to whether the failure of the mine operator to perform his statutory duty was wilful, is one of fact to be determined by the jury.

Mud Valley etc. Co. v. Phillips, 39 Ill. App. 376, p. 379;
 Donk Bros. Coal & Coke Co. v. Peton, 95 Ill. App. 193, p. 196.

It is not sufficient to maintain an action for injuries to a miner to prove merely a wilful omission of statutory duty on the part of the mine owner or operator. But it is necessary that the injury complained of shall have resulted

from such omission and that the omission complained of was the proximate cause of the injury.

- Odin Coal Co. v. Denman, 185 Ill. 413, p. 418;
 Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 528.
 See Missouri Mal. Iron Co. v. Dillon, 206 Ill. 145;
 Athens Mining Co. v. Carnduff, 221 Ill. 354, p. 357;
 Catlett v. Young, 143 Ill. 74;
 Carterville Coal Co. v. Abbott, 181 Ill. 495;
 Springvalley Coal Co. v. Greig, 226 Ill. 511, p. 519;
 Odin Coal Co. v. Denman, 84 Ill. App. 190.

In an action by a coal miner against a mine operator for damages for injuries caused by an explosion of gas it is sufficient to justify a recovery where the evidence shows that through the wilful neglect of the statutory duty a dangerous accumulation of gas was caused resulting in the injuries complained of. A miner working in a mine is entitled to the protection afforded by the performance of the duties imposed by the statute.

- Mud Valley etc. Co. v. Phillips, 39 Ill. App. 376, p. 379.
 See Coal Run Coal Co. v. Jones, 19 Ill. App. 371.

Mere noncompliance with the requirements of the statute is not necessarily a wilful failure to observe such requirements. A jury in an action for damages might be justified in regarding noncompliance as wilful from circumstances, but whether so or not is a question of fact for the jury to determine from the proof either positive or circumstantial.

- Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 68;
 Odin Coal Co. v. Denman, 84 Ill. App. 190, p. 201.
 See Moore v. Centralia Coal Co., 140 Ill. App. 291, p. 297.

21. NEGLIGENCE OF OPERATOR—CARE EXERCISED BY MINER.

If a miner is injured as a result of some act of negligence upon the part of the mine owner other than failure to comply with specific duties required by the statute, then the miner so injured must have been in the exercise of ordinary care before he can maintain an action and must allege and prove that he was at the time of the injury in the exercise of such care; but the rule is different under this legislation, and where there is a wilful failure to comply with the provisions of the statute, the right of recovery can not depend in such case on the exercise of ordinary care by the person injured, nor can he be precluded from a recovery by mere contributory negligence.

- Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 503;
 Litchfield Coal Co. v. Taylor, 81 Ill. 590;
 Catlett v. Young, 143 Ill. 74;
 Carterville Coal Co. v. Abbott, 81 Ill. App. 279, affirmed;
 Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 95, p. 96;
 Willis Coal Mining Co. v. Grizzell, 100 Ill. App. 480, p. 484;
 Kirchener v. Schoal Creek Co., 162 Ill. App. 52, p. 54;
 Kilduff v. Consolidated Coal Co., 164 Ill. App. 194, p. 197.
 See Bartlett Coal & Min. Co. v. Roach, 68 Ill. 174;
 Calumet Iron & Steel Co. v. Martin, 115 Ill. 358;
 Coal Run Co. v. Coughlin, 19 Ill. App. 412, p. 416.

Gross negligence is regarded in this State simply as the want of use of ordinary care; ordinary care is all that is required, but this is required in all cases. In some cases more action is required to avoid injury than in others because of the variant circumstances and the different situations under which the injury may occur.

- Chicago, etc., Coal Co. v. Peterson, 39 Ill. App. 114, p. 117.

22. CARE REQUIRED OF MINER.

A coal miner waiting for props to sustain the roof of a mine where he was working, the delivery of which was required by the statute to be made to the

miner by the mine operator through the empty car drivers, may be justified in continuing work notwithstanding there was apprehended danger, for a reasonable length of time after the demand for props, expecting the props to be delivered; but under some circumstances reasonable care would require the miner to desist at once from working. A miner under such circumstances must act as a reasonable, prudent person should act which would denominate reasonable or ordinary care.

Chicago, etc., Coal Co. v. Peterson, 30 Ill. App. 114, p. 118.

In an action for injuries occasioned by any wilful violation of this act or by wilful failure to comply with any of its provisions, the right of recovery should not depend upon the exercise of ordinary care on the part of the person injured or killed; but if the statute has been complied with, or if the injury is not occasioned by its wilful violation or wilful failure to comply, but by some other alleged negligence of the mine owner and the person injured or killed failed to use ordinary care, then there would be no right of action.

Catlett v. Young, 38 Ill. App. 198, p. 201;

Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 68.

See Catlett v. Young, 143 Ill. 74.

A miner in imminent peril is not required to exercise the care and prudence that he would under ordinary circumstances.

Swengel v. Illinois Third Vein Coal Co., 154 Ill. App. 409, p. 413.

23. MINER MAY ASSUME OPERATOR HAS COMPLIED WITH STATUTE.

Under this statute the duty of making each morning an examination and having a written report thereof is placed upon the operator of a mine and miners have a right to act upon the theory that the operator has complied with the law. No miner is bound to see either that an examination or a report has been made.

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248, p. 253.

The amended section 4 of this act makes it the duty of a mine owner or operator to make an examination of the mine every morning and no persons are allowed to enter the mine until the examiner has reported all of the conditions safe for beginning work. The examiner is required to make a daily record of the condition of the mine in a book kept for that purpose, which shall be accessible to all employees in and about the mine. Where the required examination was made but the report of the examiner did not state that all of the conditions were safe for beginning work, but workmen were permitted to enter the mine and begin work. The driver of a coal car under such circumstances was not required to look for the record, nor was he required to rely on the promise of a mine foreman to make an entry safe, but he had the right to assume that the operator would not only keep its promise to repair but that it would comply with the statutory requirements, and he was not bound to ascertain each morning whether or not the owner or operator was complying with the statute, and he may recover damages for injuries sustained by reason of the unsafe condition of the roadway.

Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;

Pawnee Coal Co. v. Royce, 79 Ill. App. 469, reversed;

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 527.

See Hollingshead v. Wabash Coal Co., 142 Ill. App. 641, p. 645.

24. CONTRIBUTORY NEGLIGENCE OF MINER.

This statute is a reenactment in substance of the statute of 1872 and the reenactment of section 14 giving the right of action is in the same language. The legislature must be regarded as acting in view of the interpretation that

had been placed by the courts upon the act of 1872, and intended that in case of injuries occasioned by the wilful violation of this act or by wilful failure to comply with any of its provisions, the right of recovery should not depend upon the exercise of ordinary care by the person injured or killed, or that a recovery should be precluded by contributory negligence.

Cutlett v. Young, 143 Ill. 74, p. 81.

See Cutlett v. Young, 38 Ill. App. 198, p. 202.

Mere contributory negligence on the part of a miner will not defeat a right of recovery where he is injured by the wilful disregard of the statute, either by an act of omission or commission on the part of the owner, operator, or manager. The principles applicable to negligence and contributory negligence are not to be applied where the negligence and contributory negligence relate to the violation of the state and the provisions of the constitution, which are mandatory in requiring the legislation, as this would destroy the effect of the statute.

Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 502;

Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;

Odin Coal Co. v. Denman, 185 Ill. 418, p. 419;

Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 833, p. 337;

Spring Valley Coal Co. v. Rowatt, 196 Ill. 156, p. 160;

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 523;

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 388;

Spring Valley Coal Co. v. Patting, 210 Ill. 342, p. 353;

Spring Valley Coal Co. v. Patting, 112 Ill. App. 4, affirmed;

O'Fallon Coal Min. Co. v. Laquet, 198 Ill. 125, p. 129;

Donk Bros. Coal Co. v. Stroff, 200 Ill. 483, p. 487;

Donk Bros. Coal Co. v. Stroff, 100 Ill. App. 576, p. 581, affirmed;

Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 95, p. 96;

Carterville Coal Co. v. Abbott, 81 Ill. App. 279, affirmed;

Willis Coal Min. Co. v. Grizzell, 100 Ill. App. 490, p. 484;

Sunnyside Coal Co. v. Center, 100 Ill. App. 546, p. 547;

Kirchener v. Schoal Creek Coal Co., 162 Ill. App. 52, p. 54;

Kilduff v. Consolidated Coal Co., 164 Ill. App. 194, p. 197;

Mertens v. Southern Coal Min. Co., 235 Ill. 540, p. 548.

See Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 124.

In an action under this statute for damages for the death of a miner caused by the failure of the mine operator to comply with the statute, the contributory negligence on the part of the engineer in the management of the engine cannot affect the right of recovery.

Beard v. Skeldon, 18 Ill. App. 54, p. 62.

A wilful disregard by the owner or operator of a coal mine of the duties imposed by this statute is a wilful exposure to injury of the miners employed and is an act of negligence of so gross a character and such an utter disregard of law that the question of contributory negligence, merely, has no place in the case as relieving such owner or operator from liability for an injury which has resulted solely from the fact of such negligence.

Carterville Coal Co. v. Abbott, 181 Ill. 495, p. 502;

Pawnee Coal Co. v. Royce, 184 Ill. 402, p. 415;

Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 833, p. 337;

Spring Valley Coal Co. v. Rowatt, 196 Ill. 156, p. 160;

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 523;

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 290;

Carterville Coal Co. v. Abbott, 81 Ill. App. 279, affirmed;

Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 95, p. 96;

Willis Coal Min. Co. v. Grizzell, 100 Ill. App. 490, p. 484;

Sunnyside Coal Co. v. Center, 100 Ill. App. 546, p. 547.

Athens Min. Co. v. Carnduff, 123 Ill. App. 178, p. 186;

Kirchener v. Schoal Creek Coal Co., 162 Ill. App. 52, p. 54;

Kilduff v. Consolidated Coal Co., 164 Ill. App. 194, p. 197.

See Taylor Coal Co. v. Dawes, 220 Ill. 145, p. 148;

Odin Coal Co. v. Denman, 185 Ill. 418, p. 418.

25. ASSUMPTION OF RISK—KNOWLEDGE OF DANGER.

Where the operator employs a timberman to do his work and employs the miners, loaders, engineers and others to do theirs respectively, he expects each will do his own without negligence, but he does not by any means guarantee or assume in favor of the others that each should so do. Each miner assumes all the risk of injury through the negligence of his fellow miners, and the employment of a timberman is not an exception.

Consolidated Coal Co. v. Scheller, 42 Ill. App. 630, p. 637.

See Throughgear v. Lower Vein Coal Co., 62 Iowa 576;

Hall v. Johnson, L. J. Ex. 222.

A coal mine operator is not bound to give a miner notice of the ordinary dangers pertaining to the particular service, for the reason that all persons engaged in it are presumed to know them; and the dangers of parts of the roof of a mine being or becoming loose and falling is among such dangers. And a miner cannot complain of want of such notice in any event where he had actual knowledge of the dangerous place in the roof.

Consolidated Coal Co. v. Scheller, 42 Ill. App. 630, p. 639.

26. STATUTE NOT ABOGATED BY CONTRACT.

It is against public policy to permit the provisions of the statute made for the protection of miners to be dispensed with by contract of employment between a coal mine operator and the miner by which, even for a consideration, the miner consented or agreed to waive any right of action for damages for injuries that might occur to him by reason of the failure of the operator to comply with the statute. But a miner injured by reason of the failure of the mine operator to comply with the statute may, for a consideration, settle and compromise his claim and on receipt of the amount agreed upon, release the mine operator from further liability.

Chicago, etc., Coal Co. v. Peterson, 39 Ill. App. 114, p. 119.

27. VICE PRINCIPAL OR AGENT—DUTIES—RIGHT TO RECOVER.

An agent or a person in the position of a vice principal employed by the owner to operate a coal mine and given full authority in the mining of coal and furnished with the necessary means and given opportunity for providing the appliances required by the statute, cannot maintain an action for his own dereliction of duty, as a party cannot be heard to allege his own illegal act and demand a recovery against another.

Beaucoup Coal Co. v. Cooper, 12 Ill. App. 373, p. 379.

Under the provisions of section 6 of this act requiring the owner, agent or operator at every coal mine operated by shaft to provide sufficient means for lowering or hoisting persons in a cage, an action cannot be maintained for the death of a pit boss who had charge of the mine and who represented the owner and had full charge of the mining of coal and the hoisting apparatus, and whose duty it was to see that the cages were properly provided with the appliances required by the statute, and who was furnished with the necessary means by the mine owner and had ample time and opportunity to provide the required appliances.

Beaucoup Coal Co. v. Cooper 12 Ill. App. 373, p. 375.

28. ACTION FOR DEATH—WHO MAY SUE—SINGLE RECOVERY.

Section 44 gives the widow of a deceased miner a right of action only in the event that the death of her husband was occasioned by the wilful failure of a mine owner or operator to comply with the provisions of the statute, or by a wilful violation of the statute. But if the death was caused by some mere negligence or default of a mine owner or operator, not wilful in its character, the right of recovery would not be in the widow, but in an administrator suing under a different statute.

Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60, p. 63;
 Consolidated Coal Co. v. Parson, 66 Ill. App. 434, p. 438;
 Girard Coal Co. v. Wiggins, 52 Ill. App. 69;
 Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567;
 Kellyville Coal Co. v. Hill, 87 Ill. App. 424;
 Himrod Coal Co. v. Schroath, 91 Ill. App. 234, p. 238.
 See Consolidated Coal Co. v. Schieber, 65 Ill. App. 304.

Under this statute the widow is the proper person to maintain an action for the death of her husband, a coal miner. The general statute of 1874 did not repeal by implication the section giving the widow the authority to maintain an action for the death of her husband. The act in relation to miners is special and must control as to all cases especially enumerated in the act itself.

Litchfield Coal Co. v. Taylor, 81 Ill. 590;
 Collins Coal Co. v. Hadley, 38 Ind. App. 637, p. 651.

The general statute authorizing the personal representative to sue for a death caused by the wrongful act, neglect or default of another, does not take the place of and does not supersede this particular statute and does not make proper or admissible evidence of the pecuniary circumstances of the widow and next of kin.

Beard v. Skeldon, 13 Ill. App. 54, p. 60;
 Consolidated Coal Co. v. Yung, 24 Ill. App. 255, p. 257.

This statute contemplates the recovery of damages sustained by a widow, the lineal heirs, adopted children and others dependent upon the deceased for support, but it gives one action only. It provides that "a right of action" shall accrue to the widow of the person killed, his lineal heirs or adopted children, or to any other person or persons dependent upon him for support. But one right of action only is created and that right may be availed by any one of several persons or class of persons. The right is given in the alternative and when one suit is brought by a person entitled to bring it, all damages recoverable for the death of a deceased must necessarily be recovered in the action.

Beard v. Skeldon, 13 Ill. App. 54, p. 59.
 See Broad Top R. Co. v. Decker, 84 Pa. St. 419.

This statute is not a penal statute and the recovery awarded is not a penalty in the nature of a fine or forfeiture nor is it awarded as a punishment, but is confined by its expressed terms to the direct damages sustained by a miner by reason of the omission or failure on the part of the operator or owner and of which complaint is made. Compensation for injuries inflicted is the ground of recovery and not punishment even for a wilful violation of the statute.

Odin Coal Co. v. Denman, 185 Ill. 413, p. 417;
 Odin Coal Co. v. Denman, 84 Ill. App. 190.

This statute authorizes but one action and but one recovery for the entire loss resulting from the wrongful or negligent death of a miner. The widow of a deceased miner is entitled to sue and recover for the loss, but if there is no widow, provision is made for a suit by other persons, and in the absence of a

widow or lineal heirs, then any person may maintain an action who, before the death of the intestate, was dependent upon him for support.

Beard v. Skeldon, 113 Ill. 536;
Willis Coal & Min. Co. v. Grizzell, 198 Ill. 313, p. 316;
Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 388;
Kellyville Coal Co. v. Bruzas, 125 Ill. App. 464, p. 468.
 See *Consolidated Coal Co. v. Maehl*, 130 Ill. 551;
Hart v. Penwell Coal Min. Co., 146 Ill. App. 155, p. 156;
McFadden v. St. Paul Coal Co., 183 Ill. App. 36, p. 40.

Under this statute a mother of a non-resident alien may sue for damages for the death of her son caused by a wilful failure of the operator of a coal mine to comply with the statute in that the operator failed to furnish props to support the roof and failed to cause a daily inspection of the mine and permitted the deceased miner to enter the room and work when no inspection had been made for three days. But the evidence must show that the mother was dependent upon the son for her support.

Kellyville Coal & Coke Co. v. Petraytis, 95 Ill. App. 635, p. 636.

While the statute fails to make any express provision as to the distribution of the moneys recovered in an action under this statute for the death of a miner, yet as it creates a right of action for the recovery of damages sustained by the several persons mentioned, the implication would seem to be unavoidable that the damages so recovered are subject to distribution among the several beneficiaries according to their respective rights. And in an action by the widow of a deceased miner evidence that the deceased left children surviving him is admissible; but evidence as to the pecuniary circumstances of the widow and children either at the time of the death of the miner or at the time of the trial, is not admissible.

Beard v. Skeldon, 113 Ill. App. 54, p. 60.

29. PURPOSE OF SURVEY.

Under this statute a land owner or mine operator may by petition to the judge of the proper circuit court have a survey and examination made of his mine or premises by some competent person to be appointed by the judge of the court to ascertain if a mine was being worked on the premises of the petitioner.

Monmouth Min., etc., Co. v. Regmier, 49 Ill. App. 385, p. 387.

Section 2 of the statute simply gives legal authority to make the survey provided for and to go into the mine owner's premises while otherwise it would be a trespass and it is in the nature of a search warrant. The statute requires no record to be made of the survey, nor that a plat thereof and report be made in writing, or report made to the circuit judge or court, and the report is not admissible in evidence. The duties of the circuit judge end upon the appointment of the surveyor unless it be necessary to proceed against him for non-performance of duty by way of contempt of court.

Monmouth Min., etc., Co. v. Regmier, 49 Ill. App. 385, p. 387.

One object of section 2 is to obtain evidence as to whether mining operations are being carried on by one operator under or on the premises of another. When this object is obtained the duties of the surveyor or appointee of the court ceases. The surveyor may be a witness and make a plat explanatory of his survey and a party may introduce it in evidence in connection with an oath of a witness describing its accuracy; but the plat itself without proof, much less a report by the surveyor, is not admissible.

Monmouth Min., etc., Co. v. Regmier, 49 Ill. App. 385, p. 386.

30. MINING UNDER SURFACE—DAMAGES.

In an action by a land or mine owner against another mine owner or operator for damages for mining under the surface of the land there can be no recovery of damages for causing a well on the complainant's land to dry up and become worthless where it appeared that the excavation was some 90 feet from the surface and the well was only about 35 feet deep and where another well and a pond were not affected by the mining operations and where subsequently through a dry spell the complainant's well had a supply of water.

Monmouth Min., etc., Co. v. Regmier, 49 Ill. App. 385, p. 388.

31. REPEALING EFFECT.

This act repealed all of the act of 1877 on the same subject except such portions as were retained and kept in force by the proviso to section 3.

Hamilton v. State, 102 Ill. 367, p. 369.

MINING OPERATIONS.

SECOND GENERAL REVISION, 1899.

LAWS 1899, P. 301.

APRIL 18, 1899.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

MAPS OR PLANS OF MINES.

SECTION 1. Be it enacted, etc.:

MAPS NECESSARY.—(a) That the operator of every coal mine in the State shall make, or cause to be made, an accurate map or plan of such mine, drawn to a scale not smaller than 200 feet to the inch, and as much larger as practicable, on which shall appear the name of the State, county and township in which the mine is located, the designation of the mine, the name of the company or owner, the certificate of the mining engineer or surveyor as to the accuracy and date of the survey, the north point and the scale to which the drawing is made.

SURFACE SURVEY.—(b) Every such map or plan shall correctly show the surface boundary lines of the coal rights pertaining to each mine, and all sections or quarter section lines or corners within the same; the lines of town lots and streets; the tracks and side tracks of all railroads, and the location of all wagon roads, rivers, streams, ponds, buildings, landmarks and principal objects on the surface.

UNDERGROUND SURVEY.—(c) For the underground workings said maps shall show all shafts, slopes, tunnels or other openings to the surface or to the workings of a contiguous mine; all excavations, entries, rooms and cross-cuts; the location of the fan or furnace and the direction of the air currents; the location of pumps, hauling engines, engine planes, abandoned works, fire walls and standing water; and the boundary line of any surface outcrop of the seam.

MAP FOR EVERY SEAM.—(d) A separate and similar map, drawn to the same scale in all cases, shall be made of each and every seam, which, after the passage of this Act, shall be worked in any mine, and the maps of all such seams shall show all shafts, inclined planes or other passageways connecting the same.

SEPARATE MAP FOR THE SURFACE.—(e) A separate map shall also be made of the surface whenever the surface buildings, lines or objects are so numerous as to obscure the details of the mine workings if drawn upon the same sheet with them, and in such case the surface map shall be drawn on transparent cloth or paper, so that it can be laid upon the map of the underground workings, and thus truly indicate the local relation of lines and objects on the surface to the excavations of the mine.

THE DIP.—(f) Each map shall also show by profile drawing and measurements, in feet and decimals thereof, the rise and dip of the seam from the bottom of the shaft in either direction to the face of the workings.

COPIES FOR INSPECTORS AND RECORDERS.—(g) The original or true copies of all such maps shall be kept in the office at the mine, and true copies thereof shall also be furnished to the State Inspector of Mines for the district in which said mine is located, and shall be filed in the office of the recorder of the county in

which the mine is located, within thirty days after the completion of the same. The map so delivered to the inspector shall be the property of the State, and shall remain in the custody of said inspector during his term of office, and be delivered by him to his successor in office; they shall be kept at the office of the inspector, and be open to the examination of all persons interested in the same, but such examination shall only be made in the presence of the inspector, and he shall not permit any copies of the same to be made without the written consent of the operator or the owner of the property.

ANNUAL SURVEYS.—(h) An extension of the last preceding survey of every mine in active operation shall be made once in every twelve months prior to July 1 of every year, and the results of said survey, with the date thereof, shall be promptly and accurately entered upon the original maps and all copies of the same, so as to show all changes in plan or new work in the mine, and all extensions of the old workings to the most advanced face or boundary of said workings, which have been made since the last preceding survey. The said changes and extensions shall be entered upon the copies of the maps in the hands of the said inspector and recorder, within thirty days after the last survey is made.

ABANDONED MINES.—(i) When any coal mine is worked out or is about to be abandoned or indefinitely closed, the operator of the same shall make or cause to be made a final survey of all parts of such mine, and the results of the same shall be duly extended on all maps of the mine and copies thereof, so as to show all excavations and the most advanced workings of the mine and their exact relation to the boundary or section lines on the surface.

SPECIAL SURVEY.—(j) The State Inspector of Mines may order a survey to be made of the workings of any mine, and the results to be extended on the maps of the same and the copies thereof, whenever, in his judgment, the safety of the workmen, the support of the surface, the conservation of the property or the safety of an adjoining mine require it.

PENALTIES FOR FAILURE.—(k) Whenever the operator of any mine shall neglect or refuse, or, for any cause not satisfactory to the mine inspector, fail, for the period of three months, to furnish to said inspector and recorder, the map or plan of such mine or a copy thereof, or of the extensions thereto, as provided for in this Act, such operator shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined not more than one hundred dollars, and shall stand committed to the county jail until such fine is fully paid and in addition thereto, the inspector is hereby authorized to make or cause to be made an accurate map or plan of such mine at the expense of the owner thereof; and the costs of the same may be recovered by law from the operator in the same manner as other debts by suit; in the name of the inspector and for his use, and a copy of the same shall be filed by him with said recorder. (Amended. See page 207.)

THE MAIN SHAFT.

SEC. 2. SINKING SUBJECT TO INSPECTION.—(a) Any shaft in process of sinking, and any opening projected for the purpose of mining coal, shall be subject to the inspection of the State Inspector of Mines for the district in which said shaft or opening is located.

PASSAGEWAY AROUND THE BOTTOM.—(b) At the bottom of every shaft and at every caging place therein, a safe and commodious passageway must be cut around said landing place to serve as a traveling way by which men or animals may pass from one side of the shaft to the other without passing under or on the cage.

GATES AT THE TOP.—(c) The upper and lower landings at the top of each shaft, and the opening of each intermediate seam from or to the shaft, shall be kept clear and free from loose materials, and shall be securely fenced with automatic or other gates, so as to prevent either men or materials from falling into the shaft.

GENERAL EQUIPMENT.—(d) Every hoisting shaft must be equipped with substantial cages fitted to guide-rails running from the top to the bottom. Said cages must be safely constructed; they must be furnished with suitable boiler-iron covers to protect persons riding thereon from falling objects; they must be equipped with safety catches. Every cage on which persons are carried must be fitted up with iron bars or rings in proper place and sufficient number to furnish a secure hand hold for every person permitted to ride thereon. At the top landing cage supports, where necessary, must be carefully set and adjusted so as to act automatically and securely hold the cage when at rest.

THE ESCAPEMENT SHAFT.

SEC. 3. TWO PLACES OF EGRESS.—(a) For every coal mine in this State, whether worked by shaft, slope or drift, there shall be provided and maintained, in addition to the hoisting shaft, or other place of delivery, a separate escapement shaft or opening to the surface, or an underground communicating passageway between every such mine and some other contiguous mine, such as shall constitute two distinct and available means of egress to all persons employed in such coal mine.

The time allowed for completing such escapement shaft or making such connections with an adjacent mine, as is required by the terms of this Act, shall be three months for shafts 200 feet or less in depth, and six months for shafts less than 500 feet and more than 200 feet, and nine months for all other mines, slopes or drifts or connections with adjacent mines. The time to date in all cases from the hoisting of coal from the main shaft.

UNLAWFUL TO EMPLOY MORE THAN TEN MEN.—(b) It shall be unlawful to employ, at any one time, more men than in the judgment of the inspector is absolutely necessary for speedily completing the connections with the escapement shaft or adjacent mine; and said number must not exceed ten men at any one time for any purpose in said mine until such escapement or connection is completed.

PASSAGeways TO ESCAPEMENT.—(c) Such escapement shaft or opening or communication with a contiguous mine as aforesaid, shall be constructed in connection with every seam of coal worked in such mine, and all passageways communicating with the escapement shaft or place of exit, from the main hauling ways to said place of exit, shall be maintained free of obstruction at least five feet high and five feet wide. Such passageways must be so graded and drained that it will be impossible for water to accumulate in any depression or dip of the same, in quantities sufficient to obstruct the free and safe passage of men. At all points where the passageway to the escapement shaft, or other place of exit, is intersected by other roadways or entries, conspicuous signboards shall be placed, indicating the direction it is necessary to take in order to reach such place of exit.

DISTANCE FROM THE SHAFT.—(d) Every escapement shaft shall be separated from the main shaft by such extent of natural strata as may be agreed upon by the inspector of the district and the owner of the property, but the distance between the main shaft and escapement shaft shall not be less than 300 feet without the consent of the inspector, nor more than 300 feet without the consent of the owner.

BUILDINGS ON THE SURFACE.—(e) It shall be unlawful to erect any inflammable structure or building in the space intervening between the main shaft and the escapement shaft on the surface, or any powder magazine in such location or manner as to jeopardize the free and safe exit of the men from the mine, by said escapement shaft, in case of fire in the main shaft building.

STAIRWAYS OR CAGES.—(f) The escapement shaft at every mine shall be equipped with safe and ready means for the prompt removal of men from the mine in time of danger, and such means shall be a substantial stairway, set at an angle not greater than forty-five degrees, which shall be provided with handrails and with platforms or landings at each turn of the stairway.

In any escapement shaft which may, at the time of the passage of this Act, be equipped with a cage for hoisting men, such cage must be suspended between guides and be so constructed that falling objects cannot strike persons being hoisted upon it. Such cage must also be operated by a steam hoisting engine, which shall be kept available for use at all times, and the equipment of said hoisting apparatus shall include a depth indicator, a brake on the drum, a steel or iron cable and safety catches on the cage.

OBSTRUCTIONS IN SHAFT.—(g) No accumulation of ice, nor obstructions of any kind shall be permitted in any escapement shaft, nor shall any steam, or heated or vitiated air be discharged into said shaft; and all surface or other water which flows therein shall be conducted, by rings or otherwise, or receptacles for the same, so as to keep the stairway free from falling water.

WEEKLY INSPECTION.—(h) All escapement shafts and the passageways leading thereto, or to the works of a contiguous mine, must be carefully examined at least once a week by the mine manager, or a man specially delegated by him for that purpose, and the date and findings of such inspection must be daily entered in the record book in the offices at the mine. If obstructions are found, their location and nature must be stated together with the date at which they are removed.

COMMUNICATION WITH ADJACENT MINE.—(i) When operators of adjacent mines have, by agreement, established underground communication between said mines, as an escapement outlet for the men employed in both, the roadways to the boundary on either side shall be regularly patrolled and kept clear of every obstruction to travel by the respective operators, and the intervening doors shall remain unlocked and ready at all times for immediate use.

When such communication has once been established between contiguous mines, it shall be unlawful for the operator of either mine to close the same without the consent both of the contiguous operator and of the State Inspector for the district: Provided, that when either operator desires to abandon mining operations, the expense and duty of maintaining such communication shall devolve upon the party continuing operations and using the same.

THE ENGINE AND BOILER HOUSE.

SEC. 4. LOCATION.—(a) Any building erected after the passage of this Act, for the purpose of housing the hoisting engine or boilers at any shaft, shall be substantially fire-proof, and no boiler house shall be nearer than sixty feet to the main shaft or opening, or to any building or inflammable structure connecting therewith.

BRAKE OR DRUM.—(b) Every hoisting engine shall be provided with a good and sufficient brake on the drum, so adjusted that it may be operated by the engineer without leaving his post at the levers.

FLANGES.—(c) Flanges shall be attached to the sides of the drum of any engine used for hoisting men, with a clearance of not less than four inches when the whole rope is wound on the drum.

CABLE FASTENINGS.—(d) The ends of the hoisting cables shall be well secured on the drum, and at least two and a half laps of the same shall remain on the drum when the cage is at rest at the lowest caging place in the shaft.

INDICATOR.—(e) An index dial or indicator, to show at all times the true position of the cages in the shaft, shall be attached to every hoisting engine for the constant information and guidance of the engineer.

SIGNALS.—(f) The code of signals, as provided for in this Act, shall be displayed in conspicuous letters at some point in front of the engineer when standing at his post.

GAUGES.—(g) Every boiler shall be provided with a steam gauge, except where two or more boilers are equipped and connected with a steam drum, properly connected with the boilers to indicate the steam pressure, and another steam gauge shall be attached to the steam pipe in the engine house, the two to be placed in such positions that both the engineer and fireman can readily see what pressure is being carried. Such steam gauges shall be kept in good order and adjusted and be tested as often at least as every six months.

SAFETY VALVES.—(h) Every boiler or battery of boilers shall be provided with a safety valve of sufficient area for the escape of steam, and with weights and springs properly adjusted.

INSPECTION OF BOILERS.—(i) All boilers used in generating steam in and about coal mines shall be kept in good order, and the operator of every coal mine where steam boilers are in use shall have said boilers thoroughly examined and inspected by a competent boiler maker or other qualified person, not an employe of said operator, as often as once in every six months, and oftener if the inspector shall deem it necessary, and the result of every such inspection shall be reported on suitable blanks to said inspector.

THE POWDER HOUSE.

SEC. 5. All blasting powder and explosive materials must be stored in a fire-proof building on the surface, located at a safe distance from all other buildings.

NOTE.—Sections 6, 7, 8, 9, and 10 are under the subject, Miner's Examining Board, page 62.

SEC. 11. BOUNDARIES DEFINED.—(a) The State shall be divided into seven inspection districts, as follows:

The first district shall be composed of the counties of Boone, McHenry, Lake, DeKalb, Kane, DuPage, Cook, LaSalle, Kendall, Grundy, Will, Livingston, and Kankakee.

The second district shall be composed of the counties of Jo Daviess, Stephenson, Winnebago, Carroll, Ogle, Whiteside, Lee, Rock Island, Henry, Bureau, Mercer, Stark, Putnam, Marshall, Peoria, and Woodford.

The third district shall be composed of the counties of Henderson, Warren, Knox, Hancock, McDonough, Schuyler, Fulton, Adams, and Brown.

The fourth district shall be composed of the counties of Tazewell, McLean, Ford, Iroquois, Vermillion, Champain, Platt, DeWitt, Macon, Logan, Menard, Mason, and Cass.

The fifth district shall be composed of the counties of Pike, Scott, Morgan, Sangamon, Christian, Shelby, Moultrie, Douglas, Coles, Cumberland, Clark, Edgar, Montgomery, Macoupin, Greene, Jersey, and Calhoun.

The sixth district shall be composed of the counties of Monroe, St. Clair, Madison, Bond, Clinton, Fayette, Marion, Effingham, Clay, Jasper, Richland, Crawford, and Lawrence.

The seventh district shall be composed of the counties of Washington, Jefferson, Wayne, Edwards, Wabash, White, Hamilton, Franklin, Perry, Randolph, Jackson, Williamson, Saline, Gallatin, Hardin, Pope, Johnson, Massac, Union, Alexander, and Pulaski.

HOW CHANGES MAY BE MADE.—(b) Provided, that the Commissioners of Labor, may, from time to time, make such changes in the boundaries of said districts as may, in their judgment, be required in order to distribute more evenly the labors and expenses of the several inspectors of mines, but this provision shall not be construed as authorizing the board to increase the number of districts.

SEC. 12. BOND.—(a) Those who receive appointment as State inspectors of mines must, before entering upon their duties as such, take an oath of office, as provided for by the constitution, and enter into a bond to the State in the sum of five thousand (5,000) dollars, with sureties to be approved by the Governor, conditioned upon the faithful performance of their duties in every particular as required by this Act; said bond, with the approval of the Governor endorsed thereon, together with the oath of office, shall be deposited with the Secretary of State.

INSTRUMENTS.—(b) For the more efficient discharge of the duties herein imposed upon them, each inspector shall be furnished at the expense of the State with an anemometer, a safety lamp and whatever other instruments may be required in order to carry into effect the provisions of this Act.

EXAMINATIONS OF MINES.—(c) State inspectors of mines shall devote their whole time and attention to the duties of their office, and make personal examination of every mine within their respective districts, and shall see that every necessary precaution is taken to insure the health and safety of the workmen employed in such mines, and that the provisions and requirements of all the mining laws of this State are faithfully observed and obeyed, and the penalties for the violation of the same promptly enforced.

AUTHORITY TO ENTER.—(d) It shall be lawful for State inspectors to enter, examine and inspect any and all coal mines and the machinery belonging thereto, at all reasonable times, by day or by night, but so as not to obstruct or hinder the necessary workings of such coal mine, and the operator of every such coal mine is hereby required to furnish all necessary facilities for making such examination and inspection.

PROCEDURE IN CASE OF OBJECTION.—(e) If any operator shall refuse to permit such inspection or to furnish the necessary facilities for making such examination and inspection, the inspector shall file his affidavit, setting forth such refusal, with the judge of the circuit court in said county in which said mine is situated, either in term time or vacation, or, in the absence of said judge, with the master in chancery in said county in which said mine is situated, and obtain an order on such owner, agent or operator so refusing as aforesaid, commanding him to permit and furnish such necessary facilities for the inspection of such coal mine, or to be adjudged to stand in contempt of court and punished accordingly.

NOTICES TO BE POSTED.—(f) The State inspector of mines shall post up in some conspicuous place at the top of each mine visited and inspected by him, a plain statement of the condition of said mine, showing what in his judgment is necessary for the better protection of the lives and health of persons employed in said mine; such statement shall give the date of inspection and be signed by the inspector. He shall also post a notice at the landing used by the men, stating what number of men will be permitted to ride on the cage at one time, and what rate of speed men may be hoisted and lowered on the cages. He must observe especially that a proper code of signals between the

engineer and top man and bottom man is established and conspicuously posted for the information of all employes.

NOTE.—Sections (g) and (h) are under the appropriate title, page 49.

INSPECTORS' ANNUAL REPORTS.—(i) Each State inspector of mines shall, at the close of the official year, to-wit: after June 30, of every year, prepare and forward to the secretary of the Bureau of Labor Statistics a formal report of his acts during the year in the discharge of his duties, with any recommendations as to legislation he may deem necessary on the subject of mining, and shall collect and tabulate upon blanks furnished by said secretary all desired statistics of mines and miners within his district to accompany said annual report.

REPORTS TO BE PUBLISHED.—(j) On the receipt of said inspectors' reports the secretary of the Bureau of Labor Statistics shall proceed to compile and summarize the same as a report of said bureau, to be known as the Annual Coal Report, which shall be duly transmitted to the Governor for the information of the General Assembly and the public. The printing and binding of said reports shall be provided for by the Commissioners of State Contracts in like manner and in like number as they provide for the publication of other official reports to the Governor.

The Secretary of State shall furnish to said inspectors, upon the requisition of the secretary of the State Bureau of Labor Statistics, whatever instruments, blanks, blank books, stationery, printing and supplies may be required by said inspectors in the discharge of their official duties; said instruments to be paid for on bills of particulars, certified by the Secretary of State and approved by the Governor.

It shall be the duty of every coal operator and every employer of labor in this State to afford to the State Commissioners of Labor, or their representatives, every facility for procuring statistics of the wages and conditions of their employes for the purpose of compiling and publishing statistics of labor and of social and industrial conditions within the State as required by law. Any person who shall hinder or obstruct the investigation of the agents of the commissioners, or shall neglect or refuse, for a period of ten days, to furnish the information called for by the schedules of the commissioners as provided above, shall be adjudged guilty of a misdemeanor and be subjected to a fine of one hundred dollars.

SEC. 13. PAY OF INSPECTORS.—Each State Inspector of mines shall receive as compensation for his services the sum of \$1,800.00 per annum, and for his travelling expenses the sum actually expended for that purpose, in the discharge of his official duties, both to be paid quarterly by the State Treasurer, on warrants of the Auditor of Public Accounts, from the funds in the treasury not otherwise appropriated; said expense vouchers shall show the items of expenditures in detail, with sub-vouchers for the same so far as it is practicable to obtain them. Said vouchers shall be sworn to by the inspector and be approved by the Secretary of the Bureau of Labor Statistics and the Governor.

SEC. 14. REMOVAL OF INSPECTORS.—Upon a petition signed by not less than three coal operators, or ten coal miners, setting forth that any State inspector of mines neglects his duties, or that he is incompetent, or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, it will be lawful for the Commissioners of Labor of this State to issue a citation to the said inspector to appear, at not less than fifteen days' notice on a day fixed, before them, when the said commissioners shall proceed to inquire into and investigate the allegations of the petitioners; and

if the said commissioners find that the said inspector is neglectful of his duty, or that he is incompetent to perform the duties of said office, or that he is guilty of malfeasance in office, or guilty of any act tending to the injury of miners or operators of mines, the said commissioners shall declare the office of inspector of said district vacant, and a properly qualified person shall be duly appointed, in the manner provided for in this act, to fill said vacancy.

SEC. 15. COUNTY INSPECTORS.—The county board of supervisors, or of commissioners in counties not under township organization, of any county in which coal is produced, upon the written request of the State inspector of mines for the district in which said county is located, shall appoint a county inspector of mines as assistant to such State inspector; but no person shall be eligible for appointment as county inspector who does not hold a State certificate of competency as mine manager, and the compensation of such county inspector shall be fixed by the county board at not less than \$3.00 per day, to be paid out of the county treasury.

The State inspector may authorize any county inspector in his district to assume and discharge all the duties and exercise all the powers of a State inspector in the county for which he is appointed, in the absence of the State inspector; but such authority must be conferred in writing and the county inspector must produce the same as evidence of his powers upon the demand of any person affected by his acts; and the bond of said State inspector shall be holden for the faithful performance of the duties of such assistant inspector.

SEC. 16. DUTIES OF MINE MANAGERS AND MINERS.—(a) The mine managers shall instruct employes as to their respective duties, and shall visit and examine the various working places in the mines as often as practicable. He shall always provide a sufficient supply of props, caps and timber delivered on the miners' cars at the usual place when demanded, as nearly as possible, in suitable lengths and dimensions for the securing of the roof by the miners, and it shall be the duty of the miner to properly prop and secure his place with materials provided therefor.

VENTILATION.—(b) It shall be the duty of the mine manager to see that cross cuts are made at proper distances apart to secure the best ventilation at the face of all working places, and that all stoppings along air-ways are properly and promptly built. He shall keep careful watch over all ventilating apparatus and the air-currents in the mine, and in case of accident to fan or machinery by which the currents are obstructed or stopped, he shall at once order the withdrawal of the men and prohibit their return until thorough ventilation has been re-established.

AIR-CURRENTS AND OUTLET PASSAGE-WAYS.—(c) He shall measure or cause to be measured the air-current with an anemometer at least once a week at the inlet and outlet, and shall keep a record of such measurements for the information of the inspector. Once a week he shall make a special examination of the roadways leading to the escapement shaft or other opening for the safe exit of men to the surface, and shall make a record of any obstructions to travel he may encounter therein, together with the date of their removal.

HANDLING EXPLOSIVES.—(d) He shall give special attention to and instructions concerning the proper storage and handling of explosives in the mine, and concerning the time and manner of placing and discharging the blasting shots, and it shall be unlawful for any miner to fire shots except according to the rules of the mine. In dusty mines he must see that all hauling roads are frequently and thoroughly sprinkled. He must also see that all dangerous places above and below are properly marked, and that danger signals are displayed wherever they are required.

CARE OF ROPES, CAGES, ETC.—(e) The mine manager or superintendent must have special attention given to the condition of the hoisting ropes; they must be carefully and frequently scrutinized. Before the men are lowered in the morning the soundness of the ropes must be tested by hoisting the cages. He must also have the cages, safety catches, pumps, sumps and stables examined frequently; he must have the mine examined every morning by the mine examiner before the men are allowed to go to work, and know that the top man and bottom man are on duty, and that sufficient lights are maintained at the top and bottom landings when the men are being hoisted and lowered.

EARLY AND LATE DUTY.—(f) The mine manager or his agent shall be at his post at the mine when the men are lowered into the mine in the morning for work; he shall by some device keep a record of the number of men lowered either for a day or night shift, and he or his agent shall remain at night until all the men employed during the day shall have been hoisted out.

MAY HAVE ASSISTANTS.—(g) In mines in which the works are so extensive that all the duties devolving on the mine manager can not be discharged by one man, competent persons may be designated and appointed as assistants to the mine manager who shall exercise his functions, under his instructions.

DUTIES OF HOISTING ENGINEERS.

SEC. 17. CONSTANT ATTENDANCE.—(a) The hoisting engineer at any mine shall be in constant attendance at his engine or boilers at all times when there are workmen underground.

OUTSIDERS EXCLUDED.—(b) The engineer shall not permit any one to enter or to loiter in the engine room, except those authorized by their position or duties to do so, and he shall hold no conversation with any officer of the company or other person while the engine is in motion or while his attention is occupied with the signals. A notice to this effect shall be posted on the door of the engine house.

CARE OF ENGINE AND BOILERS.—(c) The engineer or some other properly authorized employé must keep a careful watch over the engine, boilers, pumps, ropes and winding apparatus. He must see that his boilers are properly supplied with water, cleaned and inspected at frequent intervals, and that the steam pressure does not exceed the limit established by the boiler inspector; he shall frequently try the safety valves and shall not increase the weights on the same; he shall observe that the steam and water gauges are always in good order, and if any of the pumps, valves or gauges become deranged or fail to act he shall promptly report the fact to the proper authority.

SIGNALS.—(d) The engineer must thoroughly understand the established code of signals, and these must be delivered in the engineroom in a clear and unmistakable manner, and when he has the signal that the men are on the cage he must work his engine only at the rate of speed hereafter specified in this Act.

HANDLING OF ENGINES.—(e) The engineer shall permit no one to handle or meddle with any machinery under his charge, nor suffer any one who is not a certificated engineer to operate his engine, except for the purpose of learning to operate it, and then only in the presence of the engineer in charge, and when men are not on the cage.

DUTIES OF MINE EXAMINERS.

SEC. 18. TO ENTER AND EXAMINE ALL PLACES.—(a) A mine examiner shall be required at all mines. His duty shall be to visit the mine before the men are permitted to enter it, and, first, he shall see that the air-current is traveling in its proper course and in proper quantity. He shall then inspect all places

where men are expected to pass or to work and observe whether there are any recent falls or obstructions in rooms or roadways, or accumulations of gas or other unsafe conditions. He shall especially examine the edges and accessible parts of recent falls and old gobs and air-courses. As evidence of his examination of all working places he shall inscribe on the walls of each, with chalk, the month and the day of the month of his visit.

TO POST DANGER NOTICES.—(b) When working-places are discovered in which accumulations of gas, or recent falls, or any dangerous conditions exist, he shall place a conspicuous mark thereat as notice to all men to keep out, and at once report his finding to the mine manager. No one shall be allowed to remain in any part of the mine through which gas is being carried into the ventilating current, nor to enter the mine to work therein, except under the direction of the mine manager, until all conditions shall have been made safe.

TO MAKE DAILY RECORD.—(c) The mine examiner shall make a daily record of the conditions of the mine, as he has found it, in a book kept for that purpose, which shall be preserved in the office for the information of the company, the inspector and all other persons interested, and this record shall be made each morning before the miners are permitted to descend into the mine. (Amended. See pages 203, 205.)

VENTILATION.

SEC. 19. Throughout every coal mine there shall be maintained currents of fresh air sufficient for the health and safety of all men and animals employed therein, and such ventilation shall be produced by a fan, or some other artificial means.

AMOUNT OF AIR REQUIRED.—(a) The quantity of air required to be kept in circulation and passing a given point shall be not less than 100 cubic feet per minute for each person, and not less than 600 cubic feet per minute for each animal in the mine, measured at the foot of the downcast, and this quantity may be increased at the discretion of the inspector whenever, in his judgment, unusual conditions make a stronger current necessary. Said currents shall be forced into every working place throughout the mine, so that all parts of the same shall be reasonably free from standing powder smoke and deleterious air of every kind.

MEASUREMENTS.—(b) The measurements of the currents of air shall be taken with an anemometer at the foot of the downcast, at the foot of the upcast, and at the working face of each division or split of the air current. And a record of such measurements shall be made and preserved in the office, as elsewhere provided for in this Act.

AIR CURRENTS TO BE SPLIT.—(c) The main current of air shall be so split or sub-divided as to give a separate current of reasonably pure air to every 100 men at work, and the inspector shall have authority to order separate currents for smaller groups of men, if, in his judgment, special conditions make it necessary.

VENTILATION OF STABLE.—(d) The air-current for ventilating the stable shall not pass into the intake air-current for ventilating the working parts of the mine.

SELF-CLOSING DOORS.—(e) All permanent doors in mines, used in guiding and directing the ventilating currents, shall be so hung and adjusted as to close automatically.

TRAPPERS.—(f) At all principal doorways, through which cars are hauled, an attendant shall be employed for the purpose of opening and closing said doors when trips of cars are passing to and from the workings. Places for shelter

shall be provided at such doorways to protect the attendants from being injured by the cars while attending to their duties. (Amended. See page 206.)

CROSS-CUTS.—(g) Cross-cuts shall be made not more than sixty feet apart, and no room shall be opened in advance of the air current.

STOPPINGS.—(h) When it becomes necessary to close cross-cuts connecting the inlet and outlet air-courses in mines generating dangerous gases, the stoppings shall be built in a substantial manner with brick or other suitable building material laid in mortar or cement, if practicable, but in no case shall they be built of lumber, except for temporary purposes.

AUTHORITY OF INSPECTOR.—(i) Whenever the inspector shall find men working without sufficient air, he shall at once give the mine manager or operator notice and a reasonable time in which to restore the current, and upon his or their refusal or neglect to act promptly, the inspector may order the endangered men out of the mine.

POWDER AND BLASTING.

SEC. 20. No blasting powder, or other explosives shall be stored in any coal mine and no workman shall have at any time more than one twenty-five pound keg of black powder in the mine nor more than three pounds of high explosives.

PLACE AND MANNER OF STORING.—(a) Every person who has powder or other explosives in a mine, shall keep it or them in a wooden or metallic box or boxes securely locked, and said boxes shall be kept at least ten feet from the track, and no two powder boxes shall be kept within fifty feet of each other, nor shall black powder and high explosives be kept in the same box.

MANNER OF HANDLING.—(b) Whenever a workman is about to open a box or keg containing powder or other explosive, and while handling the same, he shall place and keep his lamp at least five feet distant from said explosive, and in such position that the air current cannot convey sparks to it, and no person shall approach nearer than five feet to any open box containing powder or other explosive with a lighted lamp, lighted pipe or other thing containing fire.

COPPER TOOLS.—(c) In process of charging and tamping a hole, no person shall use any iron or steel pointed needle. The needle used in preparing a blast shall be made of copper and the tamping bar shall be tipped with at least five (5) inches of copper. No coal dust nor any material that is inflammable, or that may create a spark, shall be used for tamping, and some soft material must always be placed next to the cartridge or explosive.

USE OF SQUIBS.—(d) A miner who is about to explode a blast with a manufactured squib shall not shorten the match, saturate it with mineral oil nor ignite it except at the extreme end; he shall see that all persons are out of danger from the probable effects of such shot, and shall take measures to prevent anyone approaching, by shouting "fire!" immediately before lighting the fuse.

NOT MORE THAN ONE SHOT AT A TIME.—(e) Not more than one shot shall be ignited at the same time in any one working place, unless the firing is done by electricity or by fuses of such length that neither of the shots shall explode in less than three minutes from the time they are lighted. When successive shots are to be fired in any working place in which the roof is broken or faulty, the smoke must be allowed to clear away and the roof must be examined and made secure between shots.

MISSSED SHOTS.—(f) No person shall return to a missed shot until five minutes shall have elapsed, unless the firing is done by electricity, and then only when the wires are disconnected from the battery.

DUSTY MINES.—(g) In case the galleries, roadways, or entries of any mine are so dry that the air becomes charged with dust, the operator of such mine

must have such roadways regularly and thoroughly sprayed, sprinkled or cleaned, and it shall be the duty of the inspector to see that all possible precautions are taken against the occurrence of explosions which may be occasioned or aggravated by the presence of dust. (Amended. See page 210.)

PLACES OF REFUGE.

SEC. 21. ENGINE PLANES.—(a) On all single track hauling roads wherever hauling is done by machinery and on all gravity or inclined planes, in mines, upon which the persons employed in the mine must travel on foot to and from their work, places of refuge must be cut in the side wall not less than three feet in depth and four feet wide, and not more than twenty yards apart, unless there is a clear space of at least three feet between the side of the car and the side of the road, which space shall be deemed sufficient for the safe passage of men. On every such road which is more than 100 feet in length, a code of signals shall be established between the hauling engineer and all points on the road. A conspicuous light must be carried on the front of every trip or train of pit cars moved by machinery, except when such trip is on an inclined plane.

MULE ROADS.—(b) On all hauling roads or gangways on which the hauling is done by draft animals, or gangways whereon men have to pass to and from their work, places of refuge must be cut in the side-wall at least two and a half feet deep, and not more than twenty yards apart; but such places shall not be required in entries from which rooms are driven at regular intervals not exceeding twenty yards, and wherever there is a clear space of two and one-half feet between the car and the rib, such space shall be deemed sufficient for the safe passage of men. All places of refuge must be kept clear of obstructions and no material shall be stored nor be allowed to accumulate therein. (Amended. Page 209.)

BOYS AND WOMEN.

SEC. 22. No boy under the age of fourteen years, and no woman or girl of any age shall be permitted to do any manual labor in or about any mine, and before any boy can be permitted to work in any mine he must produce to the mine manager or operator thereof an affidavit from his parent or guardian or next of kin, sworn and subscribed to before a justice of the peace or notary public, that he, the said boy, is fourteen years of age.

SEC. 23. At every mine operated by shaft and by steam power, means must be provided for communicating distinct and separate signals to and from the bottom man, the top man and the engineer. The following signals are prescribed for use at mines where signals are required:

FROM THE BOTTOM TO THE TOP.—One bell shall signify to hoist coal or the empty cage, and also to stop either when in motion.

Two bells shall signify to lower cage.

Three bells shall signify that men are coming up; when return signal is received from the engineer, men will get on the cage and the cager shall ring one bell to start.

Four bells shall signify to hoist slowly, implying danger.

Five bells shall signify accident in the mine and a call for a stretcher.

Six bells shall call for a reversal of the fan.

FROM THE TOP TO THE BOTTOM.—One bell shall signify: All ready, get on cage.

Two bells shall signify: Send away empty cage.

Provided, that the operator of any mine may, with the consent of the inspector, add to this code of signals in his discretion, for the purpose of increasing its efficiency or of promoting the safety of the men in said mine, but what-

ever code may be established and in use at any mine, must be conspicuously posted at the top and at the bottom and in the engine room for the information and instruction of all persons concerned.

NOTE.—Section 24 is under the appropriate title, Weighing Coal. See page 393.

BOUNDARIES.

SEC. 25. TEN-FOOT LIMIT.—(a) In no case shall the workings of any mine be driven nearer than 10 feet to the boundary line of the coal rights pertaining to said mine, except for the purpose of establishing an underground communication between contiguous mines, as provided for elsewhere in this Act.

APPROACHING OLD WORKS.—(b) Whenever the workings of any part of a mine are approaching old workings, believed to contain dangerous accumulations of water or of gas, the operator of said mine must conduct the advances with narrow work, and maintain bore holes at least 20 feet in advance of the face of the work, and such side holes as may be deemed prudent or necessary.

NOTICE TO INSPECTORS.

SEC. 26. Immediate notice must be conveyed to the inspector of the proper district by the operator interested:

First—Whenever an accident occurs whereby any person receives serious or fatal injury.

Second—Whenever it is intended to sink a shaft, either for hoisting or escapement purposes, or to open a new mine by any process.

Third—Whenever it is intended to abandon any mine or to reopen any abandoned mine.

Fourth—Upon the appearance of any large body of fire damp in any mine, whether accompanied by explosion or not, and upon the occurrence of any serious fire within the mine or on the surface.

Fifth—When the workings of any mine are approaching dangerously near any abandoned mine, believed to contain accumulations of water or of gas.

Sixth—Upon the accidental closing or intended abandonment of any passage-way to an escapement outlet.

ACCIDENTS.

SEC. 27. DUTY OF INSPECTOR.—(a) Whenever loss of life or serious personal injury shall occur by reason of any explosion, or of any accident whatsoever, in or connected with any coal mine, it shall be the duty of the person having charge of said mine to report that fact, without delay, to the inspector of the district in which the mine is located, and the said inspector shall, if he deem necessary from the facts reported, and in all cases of loss of life, immediately go to the scene of said accident and render every possible assistance to those in need.

It shall moreover be the duty of every operator of a coal mine to make and preserve for the information of the inspector, and upon uniform blanks furnished by said inspector, a record of all injuries sustained by any of his employees in the pursuance of their regular occupations.

CORONERS' INQUEST.—(b) If any person is killed by any explosion, or other accident, the operator must also notify the coroner of the county, or in his absence or inability to act, any justice of the peace of said county, for the purpose of holding an inquest concerning the cause of such death. At such inquest the inspector shall offer such testimony as he may be possessed of, and may question or cross question any witness appearing in the case.

INVESTIGATION BY INSPECTOR.—(c) The inspector may also make any original or supplemental investigation which he may deem necessary, as to the nature and cause of any accident within his jurisdiction, and shall make a record of the circumstances attending the same, and of the result of his investigations, for preservation in the files of his office. To enable him to make such investigation he shall have the power to compel the attendance of witnesses, and to administer oaths or affirmations to them, and the cost of such investigations shall be paid by the county in which such accident has occurred, in the same manner as the costs of coroners' inquests are paid.

MEN ON CAGES.

SEC. 28. TOP MAN AND BOTTOM MAN.—(a) At every shaft operated by steam power, the operator must station at the top and at the bottom of such shaft a competent man, charged with the duty of attending to signals, preserving order and enforcing the rules governing the carriage of men on cages. Said top man and bottom man shall be at their respective posts of duty at least a half hour before the holisting of coal begins in the morning, and remain for half an hour after holisting ceases for the day.

LIGHTS ON LANDINGS.—(b) Whenever the holisting or lowering of men occurs before daylight or after dark, or when the landing at which men take or leave the cage is at all obscured by steam or otherwise, there must always be maintained at such landing a light sufficient to show the landing and surrounding objects distinctly. Likewise, as long as there are men underground in any mine, the operator shall maintain a good and sufficient light at the bottom of the shaft thereof, so that persons coming to the bottom may clearly discern the cage and objects in the vicinity.

SPEED OF CAGES AND OTHER REGULATIONS.—(c) Cages on which men are riding shall not be lifted nor lowered at a rate of speed greater than 6 hundred feet per minute, except with the written consent of the inspector. No person shall carry any tools, timber or other materials with him on any cage in motion, except for use in repairing the shaft, and no one shall ride on a cage containing either a loaded or empty car. No cage having an unstable or self-dumping platform shall be used for the carriage of men or materials, unless the same is provided with some convenient device by which said platform can be securely locked, and unless it is so locked whenever men or materials are being conveyed thereon. No coal shall be hoisted in any shaft while men are being lowered therein.

RIGHTS OF MEN TO COME OUT.—(d) Whenever men who have finished their day's work, or have been prevented from further work, shall come to the bottom to be hoisted out, an empty cage shall be given them for that purpose, unless there is an available exit, by slope or by stairway in an escapement shaft, and providing there is no coal at the bottom ready to be hoisted.

SAFETY LAMPS.

SEC. 29. OPERATOR MUST FURNISH.—(a) At any mine where the inspector shall find that fire-damp is being generated so as to require the use of a safety lamp in any part thereof, the operator of such mine, upon receiving notice from the inspector that one or more such lamps are necessary to the safety of the men in such mine, shall at once procure and keep for use such number of safety lamps as may be necessary.

MINE MANAGER MUST CARE FOR.—(b) All safety lamps used for examining mines or for working therein shall be the property of the operator, and shall

remain in the custody of the mine manager, or other competent person, who shall clean, fill, trim, examine and deliver the same, locked and in a safe condition, to the men, upon their request, when entering the mine, and shall receive the same from the men at the end of their shift. But miners shall be responsible for the condition and proper use of safety lamps when in their possession.

STRETCHERS AND BLANKETS.

SEC. 30. At every mine where fifty men are employed underground, it shall be the duty of the operator thereof to keep always on hand, and at some readily accessible place, a properly constructed stretcher, a woolen and water proof blanket, and a roll of bandages in good condition and ready for immediate use for binding, covering and carrying any one who may be injured at the mine. When 200 or more men are employed in any mine, two stretchers and two woolen and two water proof blankets, with a corresponding supply of bandages, shall be provided and kept on hand. At mines where fire-damp is generated there shall also be provided and kept in store a suitable supply of linseed or olive oil, for use in case men are burned by an explosion.

CAUTION TO MINERS.

SEC. 31. It shall be unlawful for any miner, workman or other person knowingly or carelessly to injure any shaft, safety lamp, instrument, air-course or brattice, or to obstruct or throw open any air-way, or carry any open lamp or lighted pipe or fire in any form into any place worked by the light of safety lamps, or within five feet of any open powder, or to handle or disturb any part of the hoisting machinery, or open any door regulating an air-current and not close the same, or to enter any part of the mine against caution, or to use other than copper needles and copper-tipped tamping bars, or to disobey any order given in pursuance of this Act, or to do any willful act whereby the lives or health of persons working in mines or the security of the mine or the machinery thereof is endangered.

SEC. 32. It shall be the duty of every operator to post, on the engine house and at the pit top of his mine, in such manner that the employes in the mine can read them, rules not inconsistent with this Act, plainly printed in the English language, which shall govern all persons working in the mine. And the posting of such notice, as provided, shall charge all employes of such mine with legal notice of the contents thereof.

PENALTIES.

SEC. 33. FOR VIOLATING THIS ACT.—Any willful neglect, refusal or failure to do the things required to be done by any section, clause or provision of this Act, on the part of the person or persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any inspector in the discharge of the duties herein imposed upon him, or any refusal to comply with the instructions of an inspector given by authority of this Act, shall be deemed a misdemeanor punishable by a fine not exceeding five hundred dollars, or by imprisonment in the county jail for a period not exceeding six months, or both, at the discretion of the court: Provided, that in addition to the above penalties, in case of the failure of any operator to comply with the provisions of this Act in relation to the sinking of escapement shafts and the ventilation of mines, the State's attorney for the county in which such failure occurs, or any other attorney, in case of his neglect to act promptly, shall proceed against such operator by injunction with-

out bond, to restrain him from continuing to operate such mine until all legal requirements shall have been fully complied with.

Any inspector who shall discover that any section of this Act, or part thereof, is being neglected or violated, shall order immediate compliance therewith, and, in case of continued failure to comply, shall, through the State's attorney, or any other attorney in case of his failure to act promptly, take the necessary legal steps to enforce compliance therewith through the penalties herein prescribed.

If it becomes necessary, through the refusal or failure of the State's attorney to act, for any other attorney to appear for the State in any suit involving the enforcement of any provision of this Act, reasonable fees for the services of such attorney shall be allowed by the board of supervisors or county commissioners, in and for the county in which such proceedings are instituted.

For any injury to person or property, occasioned by any willful violations of this Act, or willful failure to comply with any of its provisions, a right of action shall accrue to the party injured, for any direct damages sustained thereby; and in case of loss of life by reason of such willful violation or willful failure as aforesaid, a right of action shall accrue to the widow of the person so killed, his lineal heirs or adopted children, or to any other person or persons who were, before such loss of life, dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives not to exceed the sum of 5 thousand dollars. (Amended. See page 208.)

DEFINITIONS.

SEC. 34. MINE.—(a) In this Act the words "mine" and "coal mine," used in their general sense, are intended to signify any and all parts of the property of a mining plant, on the surface or underground, which contribute, directly or indirectly, under one management, to the mining or handling of coal.

EXCAVATIONS OR WORKINGS.—(b) The words "excavations" and "workings" signify any or all parts of a mine excavated or being excavated, including shafts, tunnels, entries, rooms and working places, whether abandoned or in use.

SHAFT.—(c) The term "shaft" means any vertical opening through the strata which is or may be used for purposes of ventilation or escapement, or for the hoisting or lowering of men and material in connection with the mining of coal.

SLOPE OR DRIFT.—(d) The term "slope" or "drift" means any inclined or horizontal way, opening or tunnel to a seam of coal to be used for the same purposes as a shaft.

OPERATOR.—(e) The term "operator" as applied to the party in control of a mine in this Act, signifies the person, firm or body corporate who is the immediate proprietor as owner or lessee of the plant, and, as such, responsible for the condition and management thereof.

INSPECTOR.—(f) The term "inspector" in this Act signifies the State inspector of mines, within and for the district to which he is appointed.

MINE MANAGER.—(g) The "mine manager" is the person who is charged with the general direction of the underground work, or both the underground and outside work of any coal mine, and who is commonly known and designated as "mine boss," or "foreman," or "pit boss."

MINE EXAMINER.—(h) The "mine examiner" is the person charged with the examination of the condition of the mine before the miners are permitted to enter it, and who is commonly known, and has been designated in former enactments as the "fire-boss."

NOTE.—Laws 1899, p. 301. April 18, 1899. Repealed by Act of June 6, 1911. See page 229. For Annotations see page 245.

TRAPPERS—FIRST AMENDATORY ACT.**LAWS 1903, P. 330.****MAY 12, 1903.**

AN ACT to amend section 19, paragraph f, of an act entitled, "An act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 19, paragraph f, of an act entitled, "An act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be amended to read as follows:

SEC. 19. TRAPPERS.—(f) At all principal door-ways, through which cars are hauled, an attendant shall be employed for the purpose of opening and closing said doors when trips of cars are passing to and from the workings. Places for shelter shall be provided at such door-ways to protect the attendants from being injured by the cars while attending to their duties. Provided, that in any or all mines, where doors are constructed in such a manner as to open and close automatically, attendants and places for shelter shall not be required.

NOTE.—The validity of this amendatory act is doubted for the reason that the amendatory section sets out but one paragraph (f) of the original section. The constitution, section 13, article 4, requires that when a section of an existing law is amended, the section "shall be inserted at length in the new act."

INSPECTORS—SECOND AMENDATORY ACT.**LAWS 1905 P. 325.****MAY 12, 1905.**

AN ACT to amend section 7 of an act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899.

NOTE.—This amendatory act is under the appropriate title, Miners' Examining Board, page 66.

MINE EXAMINERS—THIRD AMENDATORY ACT.**LAWS 1905, P. 324.****MAY 12, 1905.**

AN ACT to amend section 18, paragraph a, of an act entitled, "An act to revise the laws in relation to coal mines, and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899.

SECTION 1. Be it enacted, etc.: That section 18, paragraph (a) of an act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein, approved April 18, 1899, in force July 1, 1899, be and the same is hereby amended so as to read as follows:

SEC. 18. TO ENTER AND EXAMINE ALL PLACES.—(a) A mine examiner shall be required at all mines. His duty shall be to visit the mine before the men are permitted to enter it, and, first, he shall see that the air current is traveling in its proper course and in proper quantity. In order to correctly determine the quantity of air in circulation in different portions of the mine it is hereby made his duty to measure with an instrument for that purpose, the amount of air passing in the last cross cut or break through of each pair of entries or in the last room of each division in a long wall mine, and at all other points where he deems it necessary, the same to be noted in the daily book kept for that purpose. He shall then inspect all places where men are expected to pass or to work and observe whether there are any recent falls or obstructions in rooms or roadways, or accumulations of gas or other unsafe conditions. He shall especially examine the edges and accessible parts of recent falls and old gobs

and air courses. As evidence of his examination of all working places, he shall inscribe on the walls of each, with chalk, the month and day of the month of his visit.

NOTE.—The validity of this amendatory act is doubted for the reason that the amendatory section sets out but one paragraph (a) of the original section. The constitution, section 13, article 4, requires that when a section of a previous law is amended, the section "shall be inserted at length in the new act."

BOUNDARIES—FOURTH AMENDATORY ACT.

LAWS 1905, P. 325.

MAY 13, 1905.

AN ACT to amend section 11 of an act entitled, "An Act to revise the laws in relation to coal mines, and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899.

SECTION 1. Be it enacted, etc.: That section 11 of an act entitled "An act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be amended to read as follows:

SEC. 11. BOUNDARIES.—The State shall be divided into ten inspection districts, said divisions to be made by the Commissioners of Labor. They may also change from time to time the boundaries of said districts in order to more equally distribute the labors and expenses of the several mine inspectors, but this provision shall not be construed as authorizing the Commissioners of Labor to increase the number of districts.

NOTE.—The validity of this act is doubted for the reasons given in the note to the preceding act.

SIGNALS—FIFTH AMENDATORY ACT.

LAWS 1905, P. 329.

MAY 13, 1905.

AN ACT to amend section 23 of an act entitled "An Act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 23 of an act entitled "An act to revise the laws in relation to coal mines, and subjects relating thereto and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be amended so as to read as follows:

SEC. 23. At every mine operated by shaft and steam power, the means of signaling to and from the bottom man, the top man, and the engineer, shall consist of a tube, or tubes, or wire encased in wood or iron pipes, through which signals shall be communicated by electricity, compressed air or other pneumatic devices or ringing of a bell. The following signals are provided for use at mines where signals are required:

FROM THE BOTTOM TO THE TOP.—One ring or whistle shall signify to hoist coal or the empty cage, and also to stop either when in motion.

Two rings or whistles shall signify to lower cage.

Three rings or whistles shall signify that the men are coming up; when return signal is received from the engineer, men will get on the cage and the cager shall ring or whistle one to start.

Four rings or whistles shall signify to hoist slowly, implying danger.

Five rings or whistles shall signify accident in the mine and a call for a stretcher.

Six rings or whistles shall call for a reversal of the fan.

FROM TOP TO BOTTOM.—One ring or whistle shall signify: All ready, get on cage. Two rings or whistles shall signify: Send away empty cage.

Provided, that the operator of any mine may, with the consent of the inspector, add to this code of signals in his discretion, for the purpose of increasing its efficiency or of promoting the safety of the men in said mine, but whatever code may be established and in use at any mine, must be conspicuously posted at the top and at the bottom, and in the engine room, for the information and instruction of all persons concerned.

EMPLOYMENT OF BOYS AND WOMEN—SIXTH AMENDATORY ACT.

LAWS 1905, P. 826.

MAY 13, 1905.

AN ACT to amend section 22 of an act entitled, "An act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 22 of an act entitled, "An act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be amended to read as follows:

SEC. 22. BOYS AND WOMEN.—No boy under the age of sixteen years, and no woman or girl of any age, shall be permitted to do any manual labor in or about any mine, and before any boy can be permitted to work in any mine he must produce to the mine manager or operator thereof an affidavit from his parent or guardian, or next of kin, sworn and subscribed to before a justice of the peace or notary public, that he, the said boy, is sixteen years of age.

STATE MINING BOARD—SEVENTH AMENDATORY ACT.

LAWS 1907, P. 837.

MAY 27, 1907.

AN ACT to amend sections 6, 7, 8, 9, 18, and 19 of an act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, as amended by Acts approved May 13, 14, 1903, in force July 1, 1903, and as amended by Acts approved May 12, 13, 16, 1905, in force July 1, 1905, be and the same are hereby amended so as to read as follows, respectively:

NOTE.—The amended sections 6, 7, 8, and 9 are found under the appropriate title, Examination of Inspectors—Appointment. See page —.

* * * * *

SEC. 18. TO ENTER AND EXAMINE ALL PLACES.—(a) A mine examiner shall be required at all mines. His duty shall be to visit the mine before the men are permitted to enter it, and, first, he shall see that the air-current is traveling in its proper course and in proper quantity. In order to correctly determine the quantity of air in circulation in different portions of the mine it is hereby made his duty to measure with an instrument for that purpose, the amount of air passing in the last cross-cut or break through of each pair of entries, or in the last room of each division in a long wall mine, and at all other points where he deems it necessary, the same to be noted in the daily book kept for that purpose. He shall then inspect all places where men are expected to pass or to work and observe whether there are any recent falls or obstructions in rooms or roadways, or accumulations of gas or other unsafe conditions. He shall especially examine the edges and accessible parts of recent falls and old gobs and air-courses. As evidence of his examination of all working places he shall inscribe on the walls of each, with chalk, the month and the day of the month of his visit.

TO POST DANGER NOTICES.—(b) When working places are discovered in which accumulations of gas, or recent falls, or any dangerous conditions exist, he shall place a conspicuous mark thereat as notice to all men to keep out, and at once report his finding to the mine manager. No one shall be allowed to remain in

any part of the mine through which gas is being carried into the ventilating current, nor to enter the mine to work therein, except under the direction of the mine manager until all conditions shall have been made safe.

TO MAKE DAILY RECORD.—(c) The mine examiner shall make a daily record of the conditions of the mine, as he has found it, in a book kept for that purpose, which shall be preserved in the office for the information of the company, the inspector and all other persons interested, and this record shall be made each morning before the miners are permitted to descend into the mine.

VENTILATION.

SEC. 19. Throughout every coal mine there shall be maintained currents of fresh air sufficient for the health and safety of all men and animals employed therein, and such ventilation shall be produced by a fan, or some other artificial means.

AMOUNT OF AIR REQUIRED.—(a) The quantity of air required to be kept in circulation and passing a given point shall be not less than 100 cubic feet per minute for each person, and not less than 800 cubic feet per minute for each animal in the mine, measured at the foot of the downcast, and this quantity may be increased at the discretion of the inspector whenever, in his judgment, unusual conditions make a stronger current necessary. Said currents shall be forced into every working place throughout the mine, so that all parts of the same shall be reasonably free from standing powder smoke and deleterious air of every kind.

MEASUREMENTS.—(b) The measurements of the currents of air shall be taken with an anemometer at the foot of the downcast, at the foot of the upcast, and at the working face of each division or split of the air-current. And a record of such measurements shall be made and preserved in the office, as elsewhere provided for in this Act.

AIR CURRENTS TO BE SPLIT.—(c) The main current of air shall be so split or subdivided as to give a separate current of reasonably pure air to every 100 men at work, and the inspector shall have authority to order separate currents for smaller groups of men, if, in his judgment, special conditions make it necessary.

VENTILATION OF STABLE.—(d) The air-current for ventilating the stable shall not pass into the intake air-current for ventilating the working parts of the mine.

SELF-CLOSING DOORS.—(e) All permanent doors in mines, used in guiding (guiding) and directing the ventilating currents, shall be so hung and adjusted as to close automatically.

TRAPPERS.—(f) At all principal doorways, through which cars are hauled, an attendant shall be employed for the purpose of opening and closing said doors when trips of cars are passing to and from the workings. Places for shelter shall be provided at such doorways to protect the attendants from being injured by the cars while attending to their duties: Provided, that in any or all mines, where doors are constructed in such a manner as to open and close automatically, attendants and places for shelter shall not be required.

CROSS-CUTS.—(g) Cross-cuts shall be made not more than sixty feet apart, and no room shall be opened in advance of the last open cross-cut.

STOPPINGS.—(h) When it becomes necessary to close cross-cuts connecting the inlet and outlet air-courses in mines generating dangerous gases, the stoppings shall be built in a substantial manner with brick or other suitable building material laid in mortar or cement, if practicable, but in no case shall they be built of lumber, except for temporary purposes.

AUTHORITY OF INSPECTOR.—(1) Whenever the inspector shall find men working without sufficient air, he shall at once give the mine manager or operator notice and a reasonable time in which to restore the current, and upon his or their refusal or neglect to act promptly, the inspector may order the endangered men out of the mine.

MAPS—EIGHTH AMENDATORY ACT.

LAWS 1907, P. 324.

MAY 25, 1907.

AN ACT to amend section one (1) of an Act entitled, "An Act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 1 of an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto and providing for the health and safety for persons employed therein," approved April 18, 1890, and in force July 1, 1890, and the same is hereby amended to read as follows:

Sac. 1. (a) That the operator of every coal mine in this State shall make, or cause to be made, an accurate map or plan of such mine, drawn to a scale not smaller than two hundred feet to the inch, and as much larger as practicable, on which shall appear the name of the State, county and township in which the mine is located, the designation of the mine, the name of the company or owner, the certificate of the mining engineer or surveyor as to the accuracy and date of the survey, the north point, and the scale to which the drawing is made.

(b) Every such map or plan shall correctly show the surface boundary lines of the coal rights pertaining to each mine, and all section or quarter section lines or corners within the same; the lines of town lots and streets; the tracks and side-tracks of all railroads, and the location of all wagon roads, rivers, streams, ponds, buildings, landmarks and principal objects on the surface.

(c) For the underground workings, said maps shall show all shafts, slopes, tunnels or other openings to the surface or to the workings of a contiguous mine; all excavations, entries, rooms and cross-cuts; the location of the fan or furnace and the direction of the air currents, the location of pumps, hauling engines, engine planes, abandoned works, fire walls and standing water; and the boundary line of any surface out-crop of the seam.

(d) A separate and similar map, drawn to the same scale in all cases, shall be made of each and every seam which, after the passage of this Act, shall be worked in any mine, and the maps of all such seams shall show all shafts, inclined planes or other passage ways connecting the same.

(e) A separate map shall also be made of the surface whenever the surface buildings, lines or objects are so numerous as to obscure the details of the mine workings if drawn upon the same sheet with them, and in such case the surface map shall be drawn on transparent cloth or paper so that it can be laid upon the map of the underground workings, and thus truly indicate the local relation of lines and objects on the surface to the excavations of the mine.

(f) Each map shall also show by profile drawing and measurements, in feet and decimals thereof, the rise and dip of the seam from the bottom of the shaft in either direction to the face of the workings.

(g) The original or true copies of all such maps shall be kept in the office at the mine, and true copies thereof shall so be furnished to the State inspector of mines for the district in which said mine is located, and shall be filed in the office of the recorder of the county in which the mine is located, within

thirty days after the completion of the same. The maps so delivered to the inspector shall be the property of the State, and shall remain in the custody of said inspector during his term of office, and be delivered by him to his successor in office; they shall be kept at the office of the inspector, and be open to the examination of all persons interested in the same, but such examination shall only be made in the presence of the inspector, and he shall not permit any copies of the same to be made without the written consent of the operator or the owner of the property.

(h) An extension of the last preceding survey of every mine in active operation shall be made once in every twelve months prior to July 1, of every year, and the results of said survey, with the date thereof, shall be promptly and accurately entered upon the original maps and all copies of the same, so as to show all changes in plan or new work in the mine, and all extensions of the old workings to the most advanced face or boundary of said workings, which have been made since the last preceding survey. The said changes and extensions shall be entered upon the copies of the maps in the hands of the said inspector and recorder, within thirty days after the last survey is made.

(i) When any coal mine is worked out or is about to be abandoned or indefinitely closed, the operator of the same shall make or cause to be made a final survey of all parts of such mine, and the results of the same shall be duly extended on all maps of the mine and copies thereof, so as to show all excavations and the most advanced workings of the mine, and their exact relation to the boundary or section lines on the surface.

(j) The State inspector of mines may order a survey to be made of the workings of any mine, and the results to be extended on the maps of the same and the copies thereof, whenever, in his judgment, the safety of the workmen, the support of the surface, the conservation of the property or the safety of an adjoining mine require it.

(k) Whenever the operator of any mine shall neglect or refuse, or, for any cause not satisfactory to the mine inspector, fail, for the period of three months, to furnish to said inspector and recorder the map or plan of such mine or a copy thereof, or of the extensions thereto, as provided for in this Act such operator shall be deemed guilty of a misdemeanor and on conviction thereof shall be fined not more than one hundred dollars, and shall stand committed to the county jail until such fine is fully paid and in addition thereto, the inspector is hereby authorized to make or cause to be made an accurate map or plan of such mine at the expense of the owner thereof, and the costs of the same may be recovered by law from the operator in the same manner as other debts by suit in the name of the inspector and for his use, and a copy of the same shall be filed by him with said recorder.

FAILURE TO COMPLY—PENALTIES—NINTH AMENDATORY ACT.

LAWS 1907, P. 396.

MAY 17, 1907.

AN ACT to amend section thirty-three (33) of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section thirty-three (33) of an Act entitled, "An Act to revise the laws in relation to coal mines, and subjects relating thereto and providing for the health and safety of persons employed therein," approved April 18, 1889, (1899) in force July 1, 1899, be amended so as to read as follows:

PENALTIES.

SEC. 33. FOR VIOLATING THIS ACT.—Any wilful neglect, refusal or failure to do the things required to be done by any section, clause or provision of this Act, on the part of the person or persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any inspector in the discharge of the duties herein imposed upon him, or any refusal to comply with the instructions of an inspector given by authority of this Act, shall be deemed a misdemeanor punishable by a fine not exceeding five hundred dollars, or by imprisonment in the county jail for a period not exceeding six months, or both, at the discretion of the court: Provided, that in addition to the above penalties, in case of the failure of any operator to comply with the provisions of this Act in relation to the sinking of escapement shafts and the ventilation of mines, the State's attorney for the county in which such failure occurs, or any other attorney in case of his neglect to act promptly, shall proceed against such operator by injunction without bond, to restrain him from continuing to operate such mine until all legal requirements shall have been fully complied with.

Any inspector who shall discover that any section of this Act, or part thereof, is being neglected or violated, shall order immediate compliance therewith, and, in case of continued failure to comply, shall, through the State's attorney, or any other attorney in case of his failure to act promptly, take the necessary legal steps to enforce compliance therewith through the penalties herein prescribed.

If it becomes necessary, through the refusal or failure of the State's attorney to act, for any other attorney to appear for the State in any suit involving the enforcement of any provisions of this Act, reasonable fees for the services of such attorney shall be allowed by the board of supervisors or county commissioners in and for the county in which such proceedings are instituted.

For any injury to person or property, occasioned by any wilful violations of this Act, or wilful failure to comply with any of its provisions, a right of action shall accrue to the party injured for any direct damages sustained thereby; and in case of loss of life by reason of such wilful violation or wilful failure as aforesaid, a right of action shall accrue to the widow of the person so killed, his lineal heirs or adopted children, or to any other person or persons who were, before such loss of life, dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives not to exceed the sum of ten thousand dollars: Provided, that every such action for damages in case of death shall be commenced within one year after the death of such person.

REFUGE HOLES—TENTH AMENDATORY ACT.

LAWS 1907, P. 397.

MAY 25, 1907.

AN ACT to amend section 21 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That section 21 of "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, be and the same is hereby amended so as to read as follows:

SEC. 21. ENGINE PLANES.—(a) On all single track hauling roads wherever hauling is done by machinery and on all gravity or inclined planes, in mines,

upon which the persons employed in the mine must use while performing their work or travel on foot to and from their work, places of refuge must be cut in the side wall not less than three feet in depth and four feet wide and five feet in height, and not more than twenty yards apart, unless there is a clear space of at least three feet between the side of the car and the side of the road, which space shall be deemed sufficient for the safe passage of men. On every such road which is more than 100 feet in length, a code of signals shall be established between the hauling engineer and all points on the road, except where hauling is done by mators. A conspicuous light must be carried on the front of every trip or train of pit cars moved by machinery, except when such trip is on an inclined plane.

MULE ROADS.—(b) On all hauling roads or gangways on which the hauling is done by draft animals, or gangways whereon men are obliged to be in the performance of their duties or have to pass to and from their work, places of refuge must be cut in the side wall at least two and a half feet deep, four feet wide and five feet in height, and not more than twenty yards apart; but such places shall not be required in entries from which rooms are driven at regular intervals not exceeding twenty yards, and wherever there is a clear space of two and one-half feet between the car and the rib, such space shall be deemed sufficient for the passage of men. All places of refuge must be kept clear of obstructions and no material shall be stored nor be allowed to accumulate therein.

EXPLOSIVES—ELEVENTH AMENDATORY ACT.

LAWS 1907, P. 396.

MAY 18, 1907.

AN ACT to amend section 20 of an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, as amended by Acts approved May 13, and 14, 1903, in force July 1, 1903, and further amended by Acts approved May 13, 18 and 16, 1905, in force July 1, 1905.

SECTION 1. Be it enacted, etc.: That section 20 of an Act entitled "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved April 18, 1899, in force July 1, 1899, as amended by an Act approved May 13, 1903, in force July 1, 1903, and further amended by an Act approved May 13, 1905, and in force July 1, 1905, be and the same is hereby amended to read as follows:

SEC. 20. No blasting powder, or other explosives shall be stored in any coal mine and no workman shall have at any time more than one twenty-five pound keg of black powder in the mine nor more than three pounds of high explosives, and in no case shall more than one kind of explosive be used in any one drill hole: Provided, that nothing in this section shall be construed to prevent the operator of any mine from taking into the mine, when miners are not therein, and in electrically equipped mines, while the current is turned off on roadways through which it is transported, a sufficient quantity of powder for the reasonable requirements of such mine for the next succeeding working day.

PLACE AND MANNER OF STORING.—(a) Every person who has powder or other explosives in a mine shall keep the same in a wooden box securely locked, with hinged lid, and said box shall be kept as far as practicable from the track; and all powder boxes shall be kept as far as practicable from each other and each in a secluded place; nor shall black powder and high explosives be kept in the same box.

MANNER OF HANDLING.—(b) Whenever a workman is about to open a box or keg containing powder or other explosive, and while handling the same, he shall place and keep his lamp at least five feet distant from said explosive, and

in such position that the air current can not convey sparks to it, and no person shall approach nearer than five feet to any open box containing an open keg of powder or other explosive with a lighted lamp, lighted pipe or other thing containing fire. No miner, workman or other person shall open any keg, can or other container of blasting powder or other explosive with any pick, wedge, tool, or in any manner except by the means of opening the same provided by the manufacturer thereof, and it shall be unlawful, and a violation of this Act, for any person to have in his possession in any mine any keg, can or other container of blasting powder or other explosive, containing blasting powder or other explosive which has been opened in violation of this Act.

COPPER TOOLS.—(c) In process of charging and tamping a hole, no person shall use any iron or steel pointed needle. The needle used in preparing a blast shall be made of copper and the tamping bar shall be tipped with at least five (5) inches of copper. No coal dust nor any material that is inflammable, or that may create a spark, shall be used for tamping, and some soft material must always be placed next to the cartridge or explosive, whether the same be wet or dry, or that can create a spark in tamping, be used for tamping.

USE OF SQUIBS.—(d) A miner, workman or shot firer who is about to explode a shot with a manufactured squib shall not shorten the match thereof, or saturate it with mineral oil or ignite it except at the end; and he shall see that all persons are out of danger from the probable effects of such shots, and whether using squibs or fuse shall take measures to prevent any one approaching by shouting "fire" immediately before lighting the same.

NOT MORE THAN ONE SHOT AT A TIME.—(e) Not more than one shot shall be ignited at the same time in any one working place, unless the firing is done by electricity or by fuses of such length that the interval between the explosions of any two shots shall not be less than one minute, and in no case shall any shot or shots be fired or lighted which are termed depending or dependent shots, until after the expiration of ten (10) minutes from the successful firing of such other shot or blast. When successive shots are to be fired in any working place in which the roof is broken or faulty, the smoke must be allowed to clear away and the roof must be examined and made secure between shots.

MISSED SHOTS.—(f) No person shall return to a missed shot if lighted with a squib until five (5) minutes have elapsed from the time of lighting the same, or if lighted with fuse, until the following day; and no person shall return to a missed shot when the firing is done by electricity unless the wires are disconnected from the battery.

DUSTY MINES.—(g) In case the galleries, roadways or entries of any mine are so dry that the air becomes charged with dust, the operator of such mine must have such roadways regularly and thoroughly sprayed, sprinkled or cleaned.

MINING OPERATIONS.

THIRD GENERAL REVISION, 1911.

LAWS 1911, P. 388.

JUNE 6, 1911.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Sections 1 to 6, inclusive, are included under the title, *Miners' Examining Board*—State Mining Board, page 70.

SEC. 7. MAPS REQUIRED.—(a) The operator of every coal mine in the State shall make, or cause to be made, an accurate map or plan of such mine, drawn to a scale not smaller than 200 feet to the inch. All measurements shall be in feet and decimals of a foot. On such maps shall appear the name of the State, county and township in which the mine is located, the designation of the mine, the name of the company or owner, the certificate of the mining engineer or surveyor as to the accuracy and date of the survey, the north point and the scale to which the drawing is made.

SURFACE SURVEY.—(b) Such map or plan shall accurately show the surface boundary lines of the coal rights pertaining to each mine, and all sections or quarter-section lines or corners within the same; the lines of town lots and streets; the tracks and side-tracks of all railroads, and the location of all wagon roads, rivers, streams, ponds, location and depth of holes drilled for oil, gas or water that penetrate a workable coal seam, and the elevation above the coal seam of any stream or body of water that might endanger the mine.

UNDERGROUND SURVEY.—(c) For the underground workings, said maps shall show all shafts, slopes, tunnels or other openings to the surface or to the workings of a contiguous mine; all excavations, entries, rooms and cross-cuts; the location of the fan or furnace and the direction of the air currents; the location of pumps, hauling engines, engine planes, abandoned works, fire walls and standing water; and the outcrop line of the seam, if any, on the property.

The general outline of all areas in which pillars have been drawn shall be indicated on the map.

Each underground map also shall show, in feet and decimals thereof, the elevation of the floor of the coal at reasonable intervals on the main entries and cross entries from the bottom of the shaft to the face of the workings; such elevations shall be referred to the floor of the coal at the bottom of the hoisting shaft.

MAP FOR EVERY SEAM.—(d) A separate and similar map, down to the same scale, shall be made of each and every seam, which, after the passage of this Act, shall be worked in any mine, and the maps of all such seams shall show all shafts, inclined planes or other passageways connecting the same.

SEPARATE MAP FOR THE SURFACE.—(e) A separate map also shall be made of the surface whenever the surface buildings, lines or objects are so numerous as to obscure the details of the mine workings if drawn upon the same sheet with them, and in such case the surface map shall be drawn on transparent cloth or paper, so that it can be laid upon the map of the underground workings, and thus indicate the relation of lines and objections [objects] on the surface to the excavations of the mine.

THE DIP.—(f) Each map shall also show by profile drawing and measurements, in feet and decimals thereof, the rise and dip of the seam from the bottom of the shaft in either direction to the face of the workings.

COPIES FOR INSPECTORS AND RECORDERS.—(g) The original or true copies of all such maps shall be kept in the office at the mine, and one true copy thereof shall be furnished to the State inspector of mines for the district in which said mine is located, and one shall be filed in the office of the recorder of the county in which the mine is located, within thirty days after the completion of the same. The maps so delivered to the inspector and to the recorder shall remain in the custody of said inspector and recorder during their respective terms of office, and be delivered by them to their successors in office. They shall be kept at the office of the inspector and of the recorder, and be open to the examination of all persons interested in the same, but such examination shall be made only in the presence of the inspector or the recorder. Neither the inspector nor the county recorder shall permit any copies of the same to be made without the written consent of the operator or the owner of the property.

The county recorder shall properly index such map as part of the title record of the property affected.

A copy of each map and extensions to the same shall be furnished the manager of the mine rescue stations for his use in connection with rescue work only.

ANNUAL SURVEYS.—(h) An extension of the last preceding survey of every mine in active operation shall be made once in every twelve months prior to July 1, of every year, and the results of said survey, with the date thereof shall be promptly and accurately entered upon the original maps and all copies of the same, so as to show all changes in plan or new work in the mine, and all extensions of the old workings to the most advanced face or boundary of said workings which have been made since the last preceding survey. The State inspector, the county recorder and the manager of the rescue stations shall be furnished with a copy of the said extended map or of the extensions to said map.

ABANDONED MINES.—(i) When any coal mine is worked out or is about to be abandoned or indefinitely closed, the operator of the same shall make, or cause to be made, a final survey of such mine; to show the entire worked out area when the mine was closed, and the results of the same shall be duly extended on all maps of the mine and copies thereof herein required to be filed.

SPECIAL SURVEY.—(j) The State inspector of mines, or the State Mining Board, may order a survey to be made of the workings of any mine in addition to the regular annual survey, the results to be extended on the maps of the same and the copies thereof, whenever the safety of the workmen, unlawful injury to the surface, unlawful encroachment upon adjoining property, or the safety of an adjoining mine requires it.

If the State inspector of mines or the State Mining Board shall believe any map required by this Act is materially inaccurate or imperfect, the State inspector or State Mining Board is authorized to make, or cause to be made a correct survey and map at the expense of the operator, the cost recoverable as for debt: Provided, if such test survey shows the operator's map to be correct, the State shall be liable for the expense incurred, payable in such manner as other State accounts incurred by the State Mining Board.

PENALTIES FOR FAILURE.—(k) If an operator of any mine refuses or wilfully neglects, for a period of three months, to furnish the said State inspector, the county recorder and the manager of the rescue stations the map or plan of such mine, or a copy thereof, or of the extensions thereto, as provided for

In this Act, such operator shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined not less than ten dollars nor more than one hundred dollars, in the discretion of the court, and shall stand committed to the county jail until such fine is paid, and, in addition thereto, the State inspector or State Mining Board is hereby authorized to make, or cause to be made, an accurate map or plan of such mine at the expense of the operator thereof; and the cost of the same may be recovered by law from the operator in the same manner as other debts by suit, in the name of the State inspector or the State Mining Board, and for his or its use, and copies of the same shall be filed by him or the board, one each with said recorder and said manager of the rescue stations.

SEC. 8. SINKING SUBJECT TO INSPECTION.—(a) Any shaft or other opening in process of sinking, or driving, for the purpose of mining coal, shall be subject to the inspection of the State inspector of mines for the district in which said shaft or opening is located.

(b) Over every shaft that is being sunk or shall hereafter be sunk, there shall be a safe and substantial structure to support sheaves or pulley ropes at a height not less than 15 feet above the tipping place. The landing platform of such shaft shall be so arranged that material can not fall into the shaft while the bucket is being emptied or taken from the hoisting rope. If provisions are made to land a bucket on a truck, said truck and platform shall be so arranged that material can not fall into the shaft.

(c) Rock or coal shall not be hoisted except in a bucket or on a cage when men are in the bottom of the shaft; and said bucket or cage must be connected to the hoisting rope by a safety hook, clevis or other safety attachment. The rope shall be fastened to the side of the drum and not less than three coils of rope shall remain on the drum. In shafts over 100 feet in depth, suitable provision shall be made to prevent the bucket from swinging while being lowered or hoisted, and guides provided for this purpose shall be maintained at a distance of not more than 75 feet from the bottom of the shaft.

(d) An efficient brake shall be attached to the drum of the engine used for hoisting in shaft sinking, and the drum shall be provided with a flange on each end not less than 4 inches in height.

(e) Not more than four persons shall be lowered or hoisted in or on a bucket in a shaft at one time, and no person shall ride on a loaded bucket.

(f) All blasts in shaft sinking shall be exploded by electric battery.

(g) Provision shall also be made for the proper ventilation of shafts while being sunk.

(h) No one but a certificated hoisting engineer shall be in charge of the hoisting engines while a shaft is being sunk.

SEC. 9. TWO PLACES OF EGRESS.—(a) For every coal mine in this State, whether worked by shaft, slope or drift, there shall be provided and maintained, in addition to the hoisting shaft, or other place of delivery, an escape-shaft or opening to the surface, or an underground communicating passageway with a continuous mine, so that there shall be at least two distinct and available means of egress to all persons employed in such coal mines.

DISTANCE FROM MAIN SHAFT.—(b) In mines sunk after the passage of this Act, the first escapement shall be separated from the main shaft by such extent of natural strata as may be agreed upon by the inspector of the district and the owner of the property, but the distance between the main shaft and the escapement shaft shall not be less than 500 feet nor more than 2,000 feet; Provided, that in mines employing ten (10) men or less the distance between the hoisting shaft and the escapement shaft shall not be less than two hundred and fifty (250) feet.

UNLAWFUL TO EMPLOY MORE THAN TEN MEN.—(c) It shall be unlawful to employ underground, at any one time, more men than in the judgment of the inspector are necessary to complete speedily the connections with the escapement shaft or adjacent mine; and said number must not exceed ten men at any one time for any purpose in said mine until such escapement or connection is completed.

The time allowed for completing such escapement shaft or making such connections with an adjacent mine, as is required by the terms of this Act, shall be three months for shafts 200 feet or less in depth, and six months for shafts less than 500 feet and more than 200 feet, and nine months for all other mines, slopes of [or] drifts, or connections with adjacent mines. The time to date in all cases from the hoisting of coal from the hoisting shaft: Provided, that in mines employing ten (10) men or less, the time for completing the escapement shaft shall not be more than six months from the time of hoisting coal.

STAIRWAYS OR CAGES.—(d) The escapement shaft at every mine opened after the passage of this Act shall be equipped with a substantial stairway, set at an angle not greater than forty-five degrees, which shall be provided with hand-rails, and with platforms or landings at each turn of the stairway.

If any escapement shaft, at the time of the passage of this Act, be equipped with a cage for hoisting men, such shaft, cage and all equipment used in connection therewith must conform to the requirements of this Act in reference to the hoisting and lowering of men.

PASSAGEWAYS TO ESCAPEMENT.—(e) Such escapement shaft or opening or communication with a contiguous mine as aforesaid, shall be constructed in connection with every seam of coal worked in such mine, and all passageways communicating with the escapement shaft or place of exit, from the main hauling ways to said place of exit, shall be maintained free of obstruction at least 5 feet high and 5 feet wide. Such passageways must be so graded and drained that it will be impossible for water to accumulate in any depression or dip of the same in quantities sufficient to obstruct the free passage of men. No passageway to an escapement shaft shall pass through a stable. At all points where the passageway to the escapement shaft or other place of exit is intersected by other roadways or entries, conspicuous signboards shall be placed indicating the direction it is necessary to take in order to reach such place of exit.

COMMUNICATIONS WITH ADJACENT MINES.—(f) When operators of adjacent mines have, by agreement, established underground communications between said mines as an escapement outlet for the men employed in both, the intervening doors shall remain unlocked and ready at all times for immediate use.

When such communication has once been established between contiguous mines, the operator of either shall not close the same without the consent of the operator of the contiguous mine and of the State inspector for the district: Provided, that when either operator desires to abandon mining operations the expense and duty of maintaining such communication shall devolve upon the party continuing the operations and using the same.

SEC. 10. GATES AT LANDINGS.—(a) The upper and lower landing at the top of each shaft, and the opening of each intermediate seam from or to the shaft, shall be kept clear and free from loose materials, and shall be protected with automatic or other gates. At the top landing cage supports, where necessary, must be carefully set and adjusted so as to securely hold the cage when at rest.

LIGHT ON LANDINGS.—(b) Whenever the hoisting or lowering of men occurs before daylight or after dark, or when the landing at which men take or leave the cage is at all obscured by steam or otherwise, there must always be maintained at such landing a light sufficient to show the landing and surrounding

objects distinctly. Likewise, as long as there are men underground in any mine the operator shall maintain a good and sufficient light at the bottom of the shaft thereof, so that persons coming to the bottom may clearly discern the cage and objects in the vicinity.

HOISTING EQUIPMENT.—(c) Every shaft in which men are hoisted and lowered must be equipped with a cage, or cages, fitted to guide rails running from the top to the bottom. Said cages must be substantially constructed; they must be furnished with sheet metal covers adequate to protect persons riding thereon from falling objects; they must be equipped with safety catches. Every cage on which persons are carried must be fitted with iron bars or rings in proper place and sufficient number to furnish a secure hand-hold for every person permitted to ride thereon. There shall be attached to every cage on which men are, or may be, hoisted or lowered, a horn or other device with which signals can be given on the cage.

(d) In connection with every hoisting engine used for hoisting or lowering of men there shall be provided as follows:

BRAKE ON DRUM.—(1) A good and sufficient brake on the drum, so adjusted that it may be operated by the engineer without leaving his post at the levers.

FLANGES.—(2) Flanges attached to the sides of the drum, with a distance when the whole rope is wound on the drum of not less than 4 inches between the outer layer or rope and the greatest diameter of the flange.

ROPE FASTENINGS.—(3) One end of each hoisting rope shall be well secured on the drum, and at least three laps of the same shall remain on the drum when the cage is at rest at the lowest caging place in the shaft.

The lower end of each rope shall be securely fastened to the cage by suitable sockets and chains.

INDICATOR.—(4) An index dial or indicator that plainly shows the engineer at all times the true position of the cages in the shaft.

SIGNALS.—(e) At every mine where men are hoisted and lowered by machinery there shall be provided means of signaling to and from the bottom man, the top man and the engineer. The signal system shall consist of a tube, or tubes, or wire encased in wood or iron pipes, through which signals shall be communicated by electricity, compressed air or other pneumatic devices, or by ringing a bell. When compressed air or other pneumatic devices are used for signaling, provision must be made to prevent signal from repeating or reversing. The following signals shall be used at mines where signals are required:

FROM THE BOTTOM TO THE TOP.—One ring or whistle shall signify to hoist coal or the empty cage, and also to stop either when in motion.

Two rings or whistles shall signify to lower cage.

Three rings or whistles shall signify that men are coming up or going down; when return signal is received from the engineer the men shall get on the cage and the proper signal to hoist or lower shall be given.

Four rings or whistles shall signify to hoist slowly, implying danger.

Five rings or whistles shall signify accident in the mine and a call for a stretcher.

Six rings or whistles shall signify hold cage perfectly still until signaled otherwise.

FROM TOP TO BOTTOM, one ring or whistle shall signify: All ready, get on cage.

Two rings or whistles shall signify: Send away empty cage.

Provided, that the operator of any mine may, with the consent of the inspector, add to this code of signals in his discretion. The code of signals in use at any mine shall be conspicuously posted at the top and at the bottom of

the shaft, and in the engine room at some point in front of the engineer when standing at his post.

GAUGES.—(f) Every boiler shall be provided with a glass water gauge and not less than three try cocks and also a steam gauge, except that where two or more boilers are equipped with a steam drum properly connected with the boilers to indicate the steam pressure and without any valves between said boilers and the steam drum, the steam gauge may be placed in said steam drum; and other steam gauge shall be attached to the steam pipe in the engine house, each to be placed in such a position that the engineer and the fireman can readily see what pressure is being carried. Such steam gauges shall be kept in good order, and adjusted and be tested as often, at least, as every six months.

SAFETY VALVES.—(g) Every boiler shall be provided with a safety valve with weights or springs properly adjusted, except that where two or more boilers are equipped with a steam drum properly connected with the boilers to indicate the steam pressure and without any valves between said boiler and the steam drum, the safety valve may be placed in said steam drum.

INSPECTION OF BOILERS.—(h) All boilers used in generating steam in and about coal mines or sinking shafts shall be kept in good order, and the operator of every coal mine where steam boilers are in use shall have said boilers thoroughly examined and inspected by a competent boilermaker or other qualified person, not an employe of said operator, as often as once in every six months, and oftener if the mine inspector shall so require in writing, and the result of every such inspection shall be reported on suitable blanks to said mine inspector.

RUN-AROUND AT BOTTOM.—(i) At every underground landing where men enter or leave the cage and where men must pass from one side of the cage to the other there shall be a passageway, free from obstruction and dry as possible, around the shaft not less than three feet wide for the use of men only; and animals or cars shall not be taken through such passageway while men are passing or desirous of passing through such passageway.

REFUGE PLACE ON SHAFT BOTTOM.—(j) A refuge place or places for men coming out at the close of the day's work shall be provided off the main bottom of cageroom in shaft mines, at a place or places and of such size as shall be approved by the State mining inspector. Such place or places shall be not more than 400 feet from the hoisting shaft. When leaving such refuge places to be hoisted out, the men shall be governed by the rules of the mine.

OBSTRUCTIONS IN SHAFT.—(k) No accumulation of ice or obstruction of any kind shall be permitted in any shaft in which men are hoisted or lowered; nor shall any dangerous gases or steam be discharged into said shaft in such quantities or at such times as to interfere with the safe passage of men. All surface or other water which flows therein shall be conducted by rings or otherwise to receptacles provided for the same in such manner as to prevent water from falling upon men while passing into or out of the mine or while in the discharge of their duties about the shaft bottom.

INSPECTION.—(l) All shafts by which men enter or leave the mine, and the passageways leading thereto, or to the works of a contiguous mine used as an escapement shaft shall be carefully examined at least once each week that the mine is operating and the date and findings of such an examination entered promptly in the books kept at the mine for that purpose. If obstructions to the free passage of men are found, their location and nature shall be stated in said report. Such obstructions shall be promptly removed.

SEC. 11. BUILDINGS ON THE SURFACE.—(a) After the passage of this Act, there shall not be erected or re-erected on the surface within 100 feet of any

hoisting shaft or escapement shaft, any inflammable structure: Provided, that this paragraph shall not apply to mines employing ten (10) men or less.

OIL AND OTHER EXPLOSIVES.—(b) --No oils or similarly inflammable materials shall be stored within 100 feet of any hoisting or escapement shaft, nor in any mine.

All explosive materials shall be stored in a fireproof magazine located on the surface not less than 500 feet from all other buildings in connection with the mine, and such magazine shall be so placed as not to jeopardize the free and safe exit of men from the mine in case of an explosion at the magazine.

ENGINE AND BOILER HOUSE.—(c) Any building erected after the passage of this Act, for the purpose of housing the hoisting engine or boilers at any mine, shall be substantially fireproof, and no boiler-house shall be nearer than sixty feet to the main shaft or other opening, or to any building or inflammable structure connecting therewith.

SEC. 12. TOP MAN AND BOTTOM MAN.—(a) At every shaft where men are hoisted or lowered by machinery, the operator shall station at the top and at the bottom of such shaft a competent man who shall be and is hereby charged with the duty of attending to signals, and is empowered to preserve order and enforce the rules governing the carriage of men on cages. Said top men (man) and bottom man shall be at their respective posts of duty at least half an hour before the hoisting of coal begins in the morning, and remain for half an hour after the hoisting ceases for the day.

SPEED OF CAGES AND OTHER REGULATIONS.—(b) Cages on which men are riding shall not be lifted nor lowered at a rate of speed greater than six hundred feet per minute, except with the written consent of the inspector. No person shall carry any tools, timber or other materials with him on any cage in motion, except for use in repairing the shaft, and no one shall ride on a cage containing either a loaded or empty car. No cage having an unstable or self-dumping platform shall be used for the carriage of men or materials, unless the same is provided with some device by which said platform can be securely locked, and unless it is so locked whenever men or materials are being conveyed thereon. No coal shall be hoisted in any shaft while men are being lowered therein.

RIGHTS OF MEN TO COME OUT.—(c) Whenever men who have finished their day's work, or have been prevented from further work, shall come to the bottom to be hoisted out, an empty cage shall be given them for that purpose, unless there is an available exit by slope or stairway in an escapement shaft, and providing there is no coal at the bottom ready to be hoisted. In case of injury or bona fide illness, a man shall be given a cage at once.

SEC. 13. SAFETY LAMPS.—(a) At every mine in this State, the operator shall provide and keep in condition for use not less than two safety lamps and shall provide and keep as many more as may be required in writing by the State mine inspector. Davy lamps shall not be used for any purpose except testing.

(b) All safety lamps shall be the property of the operator and when not in use shall remain in the custody of the mine manager or other competent person designated by him, who shall clean, fill, trim, examine and deliver same locked and in safe condition to the men when they enter the mine, or at some underground station designated by the mine manager for that purpose. He shall also receive the lamps from the men when they leave the mine or as they pass the underground lamp station at the end of their shift.

The person to whom lamps are thus given shall be responsible for the condition and proper use of the safety lamps while in their possession, and their return to the lamp station.

No safety lamps shall be given to any person for use in a mine nor shall any person use a safety lamp in a mine until said person has given evidence satis-

factory to the mine manager that he understands the proper use thereof and the danger of tampering with the same.

(c) No person except one duly authorized by the mine manager shall have in his possession in any part of the mine where locked safety lamps are used any matches or other means of producing fire, or any lamp key or other instrument usable for the opening of a locked safety lamp. Any person violating the provisions of this section shall be guilty of a misdemeanor and punishable as hereinafter provided relating to misdemeanors under this Act.

(d) Electric lamps which will not ignite explosive gases may be used instead of safety lamps for purposes for which safety lamps are required in this Act except for testing for explosive gas.

SEC. 14. VENTILATION.—(a) At every coal mine there shall be provided and maintained artificial means for supplying an amount of air which shall be not less than 100 cubic feet per minute for each person, and not less than 500 cubic feet per minute for each animal in the mine, measured at the foot of the downcast and of the upcast; except that in gaseous mines there shall be not less than 150 cubic feet of air per minute for each person in the mine. The inspector shall have power by order in writing to require these quantities to be increased.

(b) The main current of air shall be so split or subdivided as to give a separate current of reasonably pure air to every 100 men at work, and the inspector shall have authority to order, in writing, separate currents for smaller groups of men, if, in his judgment, special conditions render it necessary.

(c) Doors, curtains or brattices shall be placed at such places as may be designated by the mine manager, subject to the approval of the State inspector, for conducting the required amount of air into the working places. Curtains shall not be permanently used in main entries without the written consent of the State mine inspector.

(d) Away from the pillar for the mine bottom, cross-cuts between entries shall be made not more than sixty feet apart without permission of the State inspector of the district and then only in case of "faults." When such consent is given, brattice or other means must be provided within sixty feet of the face to convey the air to the working place until a cross-cut is opened up.

When undercut or sheared, the entry, cross-cut and room-neck may be advanced concurrently, but not more than one cutting shall be shot in the room-neck until the cross-cut is finished; and after the entry has advanced fifteen feet beyond the location of the new cross-cut, only one shot shall be fired in the entry to two in either or both the cross-cut and room-neck at the same shooting time.

When not undercut or sheared, the entry and cross-cut may be advanced concurrently, but no room shall be opened in advance of the last open cross-cut, and after the entry has advanced fifteen feet beyond the location of a new cross-cut only one shot shall be fired in the entry to two in the cross-cut at the same shooting time.

Not more than three shots shall be exploded at one shooting time ahead of the last open cross-cut.

(e) After the taking effect of this Act, the first cross-cut in the first room off any entry shall not be more than 50 feet from the rib of the entry, and the first cross-cut in the second room shall not be more than 80 feet from the rib of the entry, subsequently first cross-cuts in all the rooms shall be not more than 50 and 80 feet respectively from the rib of the entry. Additional cross-cuts shall not be more than 60 feet apart.

(f) All cross-cuts connecting inlet and outlet air courses, except the last one nearest the face, shall be closed with substantial stoppings to be made as nearly air-tight as possible. In the making of the air-tight partitions or stoppings, no loose material or refuse shall be used.

Cross-cuts between rooms, except the one nearest the face, shall be closed sufficiently to carry to the working places the amount of air required by law.

(g) When explosive gas in dangerous quantity is discovered in working places before the men go into the mine in the morning, such gas shall be removed by a special current of air produced by bratticing or from a pipe, before men are permitted to work in such places with other lights than safety lamps.

(h) If, in any mine, the conditions are such that in the judgment of the mine manager or the judgment of the State mine inspector expressed in writing, it is necessary to use safety lamps only in working said mine, other lights shall not be used therein.

(i) The air from the outlet of the stable shall not pass into the intake air current used for ventilating the working parts of the mine.

(j) All doors in mines, used in guiding and directing the ventilating currents shall be hung and adjusted so as to close automatically.

(k) At all doors through which three or more drivers are hauling coal on any one shift, an attendant shall be employed on said shaft (shift) for the purpose of opening and closing said doors when trips of cars are passing to and from the workings: Provided, the mine inspector in case of specially dangerous conditions, shall have power to require in writing that an attendant be placed at doors through which less than three drivers pass. Place for shelter shall be provided at such doorways to protect the attendants from being injured by the cars while attending to their duties; Provided, that in any or all mines, where doors are constructed in such a manner as to open and close automatically, attendants and places for shelter shall not be required.

(l) If the inspector shall find men working without the amount of air required by law, he shall at once notify the mine manager to increase the amount of air in accordance with the law. Upon the failure or refusal of the manager to act promptly, and in all cases where men are endangered by such lack of air, the inspector shall at once order the men affected out of the mine.

(m) In case the passageways, roadways or entries of any mine are so dry that the air becomes charged with dust, the operator of such mine must have such roadways regularly and thoroughly sprayed, sprinkled and cleaned. (Amended. See page 444.)

SEC. 15. REFUGE PLACES—POWER HAULAGE ROADS.—(a) On all single-track haulage roads, where hauling is done by machinery, which roads the persons employed in the mine must use while performing their work or travel on foot to and from their work, there shall be places of refuge on one side not less than 3 feet in depth from the side of the car, and not less than 4 feet long and 5 feet in height and not more than 60 feet apart. On rope-haulage roads, means of signaling shall be established between the haulage engineer and all points on the road. A conspicuous white light must be carried on the front, and a conspicuous red light or white signal board on the rear of every trip or train of pit cars moved by machinery.

REFUGE PLACES—MULE ROADS.—(b) On all haulage roads on which the hauling is done by draft animals, whereon men are obliged to be in the performance of their duties or have to pass to and from their work, there shall be places of refuge not less than 2½ feet in width from the side of the car, and not less than 4 feet long and 5 feet in height and not more than 60 feet apart.

ROOM NECKS AS REFUGE PLACES.—(c) Refuge places shall not be required in entries on which room necks at regular intervals not exceeding 60 feet furnish the required refuge places.

KEEPING REFUGE PLACES CLEAR.—(d) All places of refuge must be kept clear of obstructions and no material shall be stored nor be allowed to accumulate therein. They shall also be whitewashed not less than once in six months.

GOB ON HAULAGE ROADS.—(e) One side of all haulage roads shall be kept clear of refuse or materials, except timbering unless the rib or timbering on such side shall be 2½ feet or more from the rail, but in such case materials or refuse shall not be permitted within 2½ feet of the rail.

SEC. 16. CABS.—When there is more than one link on either end of car, no swinging open-hook coupling shall be used on mine cars installed after this Act shall be in force.

Mine cars in use when this Act shall become in force and effect shall be made to comply with this provision within one year thereafter.

SEC. 17. VOLTAGE.—(a) Trolley wires or other exposed electrical wires shall not carry a voltage above 275 volts.

WIRES CROSSING HAULAGE WAYS.—(b) All trolley and positive feed wires crossing places where persons or animals are required to travel shall be safely guarded or protected from such persons or animals coming in contact therewith.

(c) All terminal ends of positive wires shall be guarded so as to prevent persons inadvertently coming in contact therewith.

SEC. 18. OIL STANDARD.—(a) All illuminating oils used in coal mines shall conform to such specifications as shall be prescribed by the State Mining Board.

BRANDS OF OIL.—(b) All oils sold or offered for sale to be used for illuminating purposes in coal mines shall be stamped or branded upon the original barrel or package in which said oil is furnished to the person, firm or corporation selling or furnishing such oil to show that such oil has been tested and found to conform to the specifications prescribed by the State Mining Board.

PENALTY.—(c) Any person, firm or corporation, either by themselves, agent or employes, selling or offering to sell for illuminating purposes in any mine in this State any oil not complying with the specifications of the State Mining Board as suitable for illuminating purposes as contemplated in this Act, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than twenty five dollars, nor more than one hundred dollars for each offense; and any mine owner or operator or employe of such owner or operator who shall knowingly use, or any mine operator who shall knowingly permit to be used, for illuminating purposes in any mine in this State any oil the use of which is forbidden by this Act, shall be guilty of a misdemeanor, and shall be fined not less than five dollars nor more than twenty-five dollars.

SAMPLING AND TESTING.—(d) The State mine inspectors shall have authority to sample all oil used for illuminating purposes in the mines of this State, or kept on hand for use or for sale at such mines, and for such purpose they may enter upon the premises of any person. It shall be their duty to send to the State Mining Board to be tested a sample of any oil they have reason to suspect does not comply with the specifications of the State Mining Board in regard to illuminating oil for use in mines; and if the said sample of oil is found after suitable tests not to comply with the provisions of this Act, the person using said oil or selling or offering the same for sale, shall be prosecuted in accordance with the provisions of this Act.

SEC. 19. AMOUNT OF POWDER KEPT IN MINE.—(a) No blasting powder, or other explosives, shall be stored in any coal mine, and no workman shall have

at any time in the mine more than thirty-five pounds of black powder nor more than twenty-five pounds of permissible explosives, nor more than three pounds of other high explosives: Provided, that nothing in this section shall be construed to prevent the operator of any mine from taking into the mine, when miners are not therein, and in electrically equipped mines, while the current is turned off on roadways through which it is transported, a sufficient quantity of powder for the reasonable requirements of such mine for the next succeeding working day, but in the interim before such powder is delivered to the men, it shall be kept in a closed receptacle.

Explosives shall not be carried in the same car with tools or other materials.

PLACE AND MANNER OF KEEPING IN THE MINE.—(b) Every person who has powder or other explosives in a mine shall keep the same in a wooden box, securely locked, with hinged lid, and said box shall be kept as far as practicable from the tracks; and all powder boxes shall be kept as far as practicable from each other and each in a secluded place. Black powder and high explosives or caps shall not be kept in the same box. Detonating explosives and detonators shall not be kept in the same box.

MANNER OF HANDLING.—(c) Whenever a workman is about to open a box or keg containing powder or other explosive, and while handling the same, he shall place and keep his lamp at least five feet distant from said explosive, and in such position that the air current can not convey sparks to it, and no person shall approach nearer than five feet to any open box containing an open keg of powder or other explosive with a lighted lamp, lighted pipe or other thing containing fire. No miner, workman or other person shall open any receptacle containing an explosive except by the means of opening the same provided by the manufacturer thereof, and it shall be unlawful for any person to have in his possession in any mine any receptacle containing explosive which has been opened in violation of this act.

QUANTITY OF POWDER IN ONE CHARGE.—(d) The quantity of powder to be used in the preparation of shots shall not, in any case, exceed five (5) standard charges full of powder in coal seams five and one-half (5½) feet or over in thickness; and shall not, in any case, exceed four (4) standard charges full of powder in coal seams under five and one-half (5½) feet in thickness.

STANDARD CHARGER.—(e) For the purpose of determining the quantity of powder to be used in the preparation of any given shot, a standard charger is defined and prescribed to be a cylindrical metallic charger not to exceed twelve (12) inches in length and not to exceed one and one-half (1½) inches in diameter.

DEAD HOLES.—(f) No person shall drill or shoot a dead hole as hereinafter defined. A "dead hole" is a hole where the width of the shot at the point measured at right angles to the line of the hole is so great that the heel is not of sufficient strength to at least balance the resistance at the point. The heel means that part of the shot which lies outside of the powder.

In solid shooting, the width of the shot at the point, in seams of coal 6 feet or less in height, shall not be greater than the height of the coal, and in seams or (of) coal more than 6 feet in thickness, the width of the shot at the point shall, in no case, be more than 6 feet.

In undercut coal, no hole shall be drilled "on the solid" for any part of its length.

MIXED SHOTS.—(g) In no case shall more than one kind of explosive be used in the same drill hole.

COPPER TOOLS.—(h) The needle used in preparing a blast shall be made of copper, and any metallic tamping-bar or scraper shall be tipped with at least five (5) inches of copper. A scraper shall not be used for tamping.

TAMPING.—(i) Every blasting hole shall be tamped full from the explosive to the mouth of the hole, and no coal dust or any material that is inflammable or that may create a spark, whether the same shall be wet or dry, shall be used for tamping.

USE OF SQUIBS.—(j) When a squib is used to fire a shot it shall be unlawful to shorten or oil the match of the squib or to ignite it except at the end.

WARNING BEFORE FIRING.—(k) Before firing a shot, the person firing the same shall see that all persons are out of danger from the probable effects of such shot, and shall take measures to prevent any one approaching by shouting "fire" before lighting the same.

NOT MORE THAN ONE SHOT AT A TIME.—(l) Not more than one shot shall be lighted at the same time in any working place unless the firing is done by electricity or by fuses of such length that the intervals between the explosions of any two shots shall be not less than one minute, and in no case shall any shot or shots be fired or lighted which are termed depending or dependent shots, until after the expiration of ten minutes from the successful firing of the relieving shot or shots. When successive shots are to be fired in any working place in which the roof is broken or faulty, the smoke shall be allowed to clear away and the roof examined and made secure between shots.

MISSED SHOTS.—(m) No person shall return to a missed shot, if lighted with a squib, until five (5) minutes have elapsed from the time of lighting the same, or, if lighted with fuse, until the following day; and no person shall return to a missed shot when the firing is done by electricity unless the wires are disconnected from the battery.

(n) No missed shot shall be withdrawn excepting by the use of copper-tipped or wooden tools.

SEC. 20. (a) It shall be the duty of the mine manager:

1. To visit each working place in the mine at least once in two weeks.
2. To provide a suitable checking system whereby the entrance into and departure from the mine of each employe shall be indicated.

3. To have the underground workings of the mine examined by a certificated mine examiner within twelve hours preceding every day upon which the mine is to be operated. Such a mine examiner shall make the examination as provided in this Act, and he shall enter his report thereof before the men are permitted to enter the mine in the morning in a book provided for that purpose, which book shall be kept in some convenient place on top, but not in the engine room or office, for the information of the inspector and other persons interested therein.

4. To examine the mine examiner's report in the morning, and if the working places are reported dangerous, he shall withhold the entrance checks of men working in such places until he has advised such men of the danger and instructed them not to work in such places until the reported danger has been removed, except for the purpose of removing same.

5. When there is to be a night shift mining coal, the mine manager shall require the places in which such night shift are expected to work to be examined for gas, or falls or dangerous roof, by the person in charge of such night shift or some competent person duly authorized by him before the men enter such places for work. The night shift may go into the mine while the night examiner is in the mine, excepting in mines where marsh gas has been detected in dangerous quantities, provided they do not go into the working places until the required examination is made.

Certificated mine examiners shall not be required for the examination preceding the night shift, excepting in mines where marsh gas is detected in dangerous quantities. The night examiner, or examiners, shall make a record of

their examination in a special book kept for that purpose, which shall be kept in some convenient place on top when not in use by the examiner.

6. He shall provide a sufficient number of props, caps and timbers, when demanded, delivered on the miners' cars at the usual place, in suitable lengths and dimensions for the securing of the roof by the miners.

7. He shall see that the cross-cuts are made at proper distances apart, and that the necessary doors, curtains, and brattices are provided to secure the men in the mine the volume of air required by this Act, or by the written demands of the mine inspector; also, that all stoppings along air-ways are properly and promptly built.

8. He shall keep careful watch over all ventilating apparatus and the air currents in the mine, and in case of accident to fan or machinery by which the air currents are stopped or materially obstructed, he shall at once order the withdrawal of the men from the mine and prohibit their return until the required ventilation has been re-established.

9. He shall measure the air current or cause of [the] same to be measured at least once each week at the inlet and outlet, and shall keep a record of such measurements for the information of the mine inspector.

10. He or his assistant shall, at least once a week, examine the roadways leading to the escapement shaft or other openings for the safe exit of men to the surface; and shall make a record of any obstructions to travel he may encounter therein, together with the date of their removal.

11. He shall examine or designate a competent person to examine the hoisting ropes, cages and safety catches every morning, and shall require the ropes to be tested by hoisting the cages before the men are lowered.

12. He must see that the top man and bottom man are on duty and that sufficient lights are maintained at the top and bottom landings when the miners are being hoisted and lowered.

13. The mine manager or his assistant shall be at his post at the mine when the men are lowered into the mine in the morning for work, and shall remain at night until all the men employed during the day shall have been hoisted out.

14. He shall give special attention to and instructions concerning the proper storage and handling of explosives in the mines.

15. He shall see that all dusty haulage roads are thoroughly sprinkled at regular intervals designated by the mine inspector.

(b) The mine manager shall have power:

1. To instruct employes as to their respective duties and to require of all employes obedience to the provisions of the mining law.

2. To prescribe special rules concerning the proper storage and handling of explosives in the mine and concerning the time and manner of placing and discharging the blasting shots, and it shall be unlawful for any miner to fire shots except according to such rules.

3. In mines in which the works are so extensive that all the duties devolving upon the mine manager can not be discharged by one man, competent persons may be designated and appointed as assistants to the mine manager, who shall exercise his functions under the mine managers' instructions.

SEC. 21. CERTIFICATED MINE EXAMINERS.—(a) A certificated mine examiner shall be required at all coal mines. There shall be one or more additional certificated mine examiners whenever required in writing by the State mine inspectors when the conditions are such as to make the employment of such additional mine examiners necessary.

(b) It shall be the duty of the mine examiner:

1. To examine the underground workings of the mine within twelve hours preceding every day upon which the mines is to be operated.

2. When in the performance of his duties, to carry with him a safety lamp in proper order and condition and a rod or bar for sounding the roof.

3. To see that the air current is traveling in its proper course and in proper quantity; and to measure with an anemometer the amount of air passing in the last cross-cut or break-through of each pair of entries, or in the last room of each division in long-wall mines, and at all other points where he may deem it necessary; and to note the results of such measurements in the mine examiner's book kept for that purpose.

4. To inspect all places where men are required in the performance of their duties to pass or to work, and to observe whether there are any recent falls or dangerous roof or accumulations of gas or dangerous obstructions in rooms or roadways; and to examine especially the edges and accessible parts of recent falls and old gobs and air-courses.

5. As evidence of his examination of said rooms and roadways, to inscribe in some suitable place on the walls of each, not on the face of the coal, with chalk, the month and the day of the month of his visit.

6. When working places are discovered in which there are recent falls or dangerous roof or dangerous obstruction, to place a conspicuous mark or sign thereat as notice to all men to keep out; and in case of accumulation of gas, to place at least two conspicuous obstructions across the roadway not less than twenty feet apart, one of which shall be outside the last open cross-cut.

7. Upon completing his examination, to make a daily record of the same in a book kept for that purpose, for the information of the company, the inspector and all other persons interested; and this record shall be made each morning before the miners are permitted to enter the mine.

8. To take into his possession the entrance checks of all men whose working places have been shown by his examination and record to be dangerous, and to give such entrance checks to the mine manager before the men are permitted to enter the mine in the morning.

SEC. 22. It shall be the duty of the hoisting engineer:

1. To be in constant attendance at his engine or boilers at all times when there are workmen underground. Whenever it is the duty of the engineer to attend to the boilers, means for signaling from the shaft bottom to the boiler-room shall be provided.

2. He shall not permit any one except persons duly authorized to enter the engine-room, and he shall hold no communication with any officer of the company or other person while the engine is in motion or while his attention is occupied with the signals.

3. The engineer or some other properly authorized employe shall:

(a) Keep a careful watch over the engines, boilers, pumps, ropes and winding apparatus under his jurisdiction.

(b) See that the boilers under his care are properly supplied with water cleaned and inspected at frequent intervals.

(c) See that the steam pressure does not exceed the limit established by the boiler inspector, and frequently try the try cocks and the safety valves and shall not increase the weights on the same.

(d) See that the steam and water gauges are kept in good order, and if any of the pumps, valves or gauges become deranged or fail to act, promptly report the fact to the proper authority.

4. He shall thoroughly understand the established code of signals, and when he has the signal that men are on the cage he must operate his engine at not to exceed the rate of speed permitted by this Act.

5. He shall permit no one to handle, except in the discharge of duty, or meddle with any machinery under his charge or suffer any one who is not a certificated engineer to operate his engine except for the purpose of learning to operate it, and then only in the presence of the engineer in charge and when men are not on the cage.

SEC. 23. SPECIAL RULES.—(a) It shall be unlawful for any person knowingly or negligently:

1. To injure or tamper with any appliance or machinery.
2. To carry an open light, pipe or fire in any form into any place worked by the light of safety lamps, or within five feet of an open package of explosive.
3. To open any locked safety lamp without permission from the proper authority.
4. To handle or disturb any part of the hoisting machinery without proper authority.
5. To obstruct or cause any obstruction in any air current or to leave open any door or other means provided to control the air current or to perform any act that will interfere with the ventilating current of the mine without permission to do the same from the mine manager.
6. To deface, pull down or destroy any notice board, danger signal, special rule or record book.

(b) No person shall be permitted to or shall enter work in or about a mine or mine buildings, tracks or machinery connected therewith while under the influence of intoxicants.

(c) Every miner shall sound and thoroughly examine the roof of his working place before commencing work, and if he finds loose rock or other dangerous conditions, he shall not work in such dangerous place except to make such dangerous conditions safe. It shall be the duty of the miner to properly prop and secure his place for his own safety with materials provided therefor.

(d) It shall be the duty of every operator to post at some conspicuous point at the entrance to the mine, in such manner that the employes of the mine can read them, rules not inconsistent with this Act, plainly printed in the English language, which shall govern all persons working in the mine. And the posting of such notice, as provided, shall charge all employes of such mine with legal notice of the contents thereof.

(e) It shall be unlawful for any person to disobey any order given in pursuance of this Act, or to enter any place against a danger signal without permission from the mine manager, or to do any wilful act whereby the lives or health of persons working in mines or the security of the mine or the machinery thereof are endangered.

(f) No mine employe shall enter or leave a mine without indicating the fact of entering or leaving said mine by some suitable checking system provided by and under the control of the mine manager.

(g) No person, except the persons necessary to operate the trip or car, shall ride on any loaded car or on the outside of any car, or get on or off a car while in motion.

(h) It shall be unlawful to change, exchange, substitute, alter or remove any number or check or other device or sign used to indicate or identify the person or persons to whom credit or pay is due for the mining of coal in any car or appliance containing the same, with intent to cheat or defraud any other person of the value of his services for mining the coal contained in such car or appliance; and it shall be unlawful for a person with intent to cheat or defraud any other to place any number, check or other device or sign upon any car or other appliance loaded by any other person in or about the mine.

Any violation of this provision shall be deemed a larceny, and upon conviction thereof shall be punishable as provided in the general statutes of Illinois with respect to larceny.

SEC. 24. TEN-FOOT LIMIT.—(a) In no case shall the workings of any mine be driven nearer than 10 feet to the boundary line of the coal rights pertaining to said mine, except for the purpose of establishing an underground communication between contiguous mines, as provided for elsewhere in this Act, or except by mutual agreement in writing between the adjoining owners.

APPROACHING ABANDONED WORKINGS.—(b) Whenever any working place approaches within 50 feet of abandoned workings of which there is a map prepared as required by law and which may contain dangerous accumulations of water or of gas, the operator of said mine shall advance by workings not more than 20 feet wide and maintain in advance of the face a bore hole not less than 10 feet in depth and one hole in each rib of the working place, 10 feet in depth, which side holes shall be drilled so as to make an angle of not less than forty-five degrees with the direction of the rib. If there is not a map of the abandoned workings, the holes heretofore provided for shall be drilled when the new workings are within 100 feet of where the old workings are supposed to be.

SEC. 25. DUTY OF INSPECTOR.—(a) Any loss of life or personal injury in or about any coal mine shall be reported without delay by the person having charge of said mine to the State Mine Inspector of the district in which the mine is located, and the said inspector, in case of injury, if he deem necessary from the facts reported, and in all cases of loss of life, shall go immediately to the scene of said accident and render every possible assistance to those in need.

Every operator of a coal mine shall make or cause to be made and preserve for the information of the State Mine Inspector, upon uniform blanks furnished by said inspector, a record of all deaths and all injuries sustained by any of his employees in the pursuance of their regular occupations.

CORONER'S INQUEST.—(b) If any person is killed in or about a mine, the operator shall also notify the coroner of the county, or in his absence or inability to act, any justice of the peace of said county, who shall hold an inquest concerning the cause of such death. The State Mine Inspector may question or cross-question any witness testifying at the inquest.

INVESTIGATION BY INSPECTION.—(c) The State Mine Inspector shall make a personal investigation as to the nature and cause of all serious accidents within his jurisdiction. He shall make a record of the circumstances attending the same, as developed by the coroner's inquest and his own personal investigation, which record shall be preserved in the files of his office, and a copy thereof filed with the State Mining Board. To enable him to make such investigation he shall have power to compel the attendance of witnesses and to administer oaths or affirmations to them, and the cost of such investigations shall be paid by the county in which such accident has occurred, in the same manner as the costs of coroner's inquests are paid.

SEC. 26. STRETCHERS AND BLANKETS.—At every mine, it shall be the duty of the operator thereof to keep always on hand, and at some readily accessible place, a properly constructed stretcher, a woolen and waterproof blanket, and a roll of bandages in good condition and ready for immediate use for binding, covering and carrying any one who may be injured at the mine. When 100 or more men are employed at any mine, two stretchers and two woolen and two waterproof blankets, and a corresponding number of bandages, shall be provided and kept on hand. At mines where fire-damp is generated, there shall also be provided and kept in store a suitable supply of linseed or olive oil, for use in case where men are burned by an explosion.

NOTE.—Section 27 is under the appropriate title, *Weighing Coal*. See page 303.

SEC. 28. BOYS AND WOMEN.—No boy under the age of sixteen years, and no woman or girl of any age, shall be permitted to do any manual labor in or about any mine, and before any boy can be permitted to work in any mine he must produce to the mine manager or operator thereof an affidavit from his parent or guardian or next of kin, sworn and subscribed to before a justice of the peace or notary public, that he, the said boy, is sixteen years of age.

The parent, guardian or next of kin shall submit in connection with said affidavit, a certificate of birth, a baptismal certificate, a passport or other official or religious record of the boy's age or duly attested transcript thereof, which certificate or transcript thereof shall, for the purposes of this Act, establish the age of said boy.

Any person swearing falsely in regard to the age of a boy shall be guilty of perjury, and shall be punished as provided in the general statutes of the State pertaining to perjury.

SEC. 29. PENALTIES.—(a) Any wilful neglect, refusal or failure to do the things required to be done by any section, clause or provision of this Act, on the part of the person or persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any inspector in the discharge of the duties herein imposed upon him, or any refusal to comply with the instructions of an inspector given by authority of this Act shall be deemed a misdemeanor punishable by a fine not exceeding five hundred dollars, or by imprisonment in the county jail for a period not exceeding six months, or both, at the discretion of the court: Provided, that in addition to the above penalties, in case of failure of any operator to comply with the provisions of this Act in relation to the sinking of escapement shafts and the ventilation of mines, the State's attorney for the county in which such failure occurs, or any other attorney, in case of his neglect to act promptly shall proceed against such operator by injunction without bond, to restrain him from continuing to operate such mine until all legal requirements shall have been fully complied with.

(b) Any inspector who shall discover that any section of this Act, or part thereof, is being neglected or violated, shall order immediate compliance therewith, and, in case of continued failure to comply, shall have power to stop the operation of the mine, or remove any offending person or persons from the mine until the law is complied with.

(c) For any injury to person or property, occasioned by any wilful violation of this Act, or wilful failure to comply with any of its provisions, a right of action shall accrue to the party injured, for any direct damages sustained thereby; and in case of loss of life by reason of such wilful violation or wilful failure as aforesaid, a right of action shall accrue to the personal representatives of the person so killed for the exclusive benefit of the widow and next of kin of such person and to any other person or persons who were, before such loss of life, dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives not to exceed the sum of ten thousand dollars: Provided, that every such action for damages in case of death shall be commenced within one year after the death of such person: And, provided further, that the amount recovered by the personal representative of the person so killed shall be distributed to the widow and next of kin of such person in the proportion provided by law in relation to the distribution of personal property left by persons dying intestate: Provided, that if and whenever there shall be in force in this State a statute or statutes providing for compensation to workmen for all injuries received in the course of their employment, the provisions thereof shall apply in lieu of the right of action for damages provided in this Act.

SEC. 30. DEFINITION OF TERMS—MINE.—(a) Where used in this Act, the words "mine" and "coal mine" are intended to signify any and all parts of the property of a mining plant, on the surface or underground, which contribute, directly or indirectly, under one management, to the mining or handling of coal.

EXCAVATION OR WORKINGS.—(b) The words "excavation" and "workings" signify any or all parts of a mine excavated or being excavated, including shafts, slopes, tunnels, entries, rooms and working places whether abandoned or in use.

SHAFT.—(c) The term "shaft" means any vertical opening through the strata which is or may be used for purposes of ventilation or escapement, or for the hoisting or lowering of men and material in connection with the mining of coal.

SLOPE.—(d) The term "slope" means any inclined way in or to a seam of coal to be used for the same purposes as a shaft.

DRIFT.—(e) The term "drift" means any practically horizontal way in or to a seam of coal to be used for the same purpose as a shaft.

OPERATOR.—(f) The term "operator" as applied to the party in control of a mine in this Act, signifies the person, firm or body corporate who is the immediate proprietor as owner or lessee of the plant, and, as such, responsible for the condition and management thereof.

MINE MANAGER.—(g) The "mine manager" is the person who is charged with the general direction of the underground work.

MINE EXAMINER.—(i) The "mine examiner" is the person charged with the examination of the underground workings of the mine before the miners are permitted to enter it in the morning.

SEC. 31. That an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein, approved April 18, 1899, and in force July 1, 1899," with amendments to July 1, 1910; and also (See page 212.)

An Act entitled, "An Act to prohibit the use of certain oils in coal mines and penalties for infraction of same," approved April 30, 1895; also (See page 354.)

An Act entitled, "An Act concerning the use of powder in coal mines," approved and in force May 14, 1903, as amended by an Act approved May 24, 1907, in force July 1, 1907; also (See page 15.)

An Act entitled, "An Act to provide for the weighing of coal at the mines, and to repeal a certain Act therein named," approved June 17, 1887, in force July 1, 1887, be and each of said Acts is hereby repealed. (See page 389.)

FIRST AMENDATORY ACT.

LAW 1913, P. 412.

JUNE 27, 1913.

AN ACT to amend sections 1, 2, 3, 5, 6, 10, 11, 14, 16, 18, 19, 20 and 21 of an Act entitled "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911.

SECTION 1. Be it enacted, etc.: That sections 1, 2, 3, 5, 6, 10, 11, 14, 16, 18, 19, 20, and 21 of an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, be and the same are hereby amended so as to read as follows:

NOTE.—Sections 1 to 6, inclusive, are under the title, Miners' Examining Board—State Board, page 77.

SEC. 10. GATES AT LANDINGS.—(a) The upper and lower landing at the top of each shaft, and the opening of each intermediate seam from or to the shaft, shall be kept clear and free from loose materials, and shall be protected with automatic or other gates, such gates to be of good, serviceable construction for

the purpose for which they are designed, namely, to prevent either men or materials from falling into the shaft. At the top landing cage supports, where necessary, must be carefully set and adjusted so as to securely hold the cage when at rest.

LIGHTS ON LANDINGS.—(b) Whenever the hoisting or lowering of men occurs before daylight or after dark, or when the landing at which men take or leave the cage is at all obscured by steam or otherwise, there must always be maintained at such landing a light sufficient to show the landing and surrounding objects distinctly. Likewise, as long as there are men underground in any mine the operator shall maintain a good and sufficient light at the bottom of the shaft thereof, so that persons coming to the bottom may clearly discern the cage and objects in the vicinity.

HOISTING EQUIPMENT.—(c) Every shaft in which men are hoisted and lowered must be equipped with a cage, or cages, fitted to guide-rails running from the top to the bottom. Said cages must be safely constructed; they must be furnished with sheet-metal covers adequate to protect persons riding thereon from falling objects; they must be equipped with safety catches. Every cage on which persons are carried must be fitted with iron bars or rings in proper place and sufficient number to furnish a secure hand-hold for every person permitted to ride thereon. There shall be attached to every cage on which men are, or may be, hoisted or lowered, a horn or other device with which signals can be given on the cage. Hoisting ropes when socketed at the cage shall be cut off and resocketed at least once each six months and a notice shall be posted in the engine room giving the date when the rope was installed and when resocketed.

(d) In connection with every hoisting engine used for hoisting or lowering of men there shall be provided as follows:

BRAKE ON DRUM.—(1) A good and sufficient brake on the drum, so adjusted that it may be operated by the engineer without leaving his post at the levers.

FLANGES.—(2) Flanges attached to the sides of the drum, with a distance when the whole rope is wound on the drum of not less than 4 inches between the outer layer of rope and the greatest diameter of the flange.

ROPE FASTENINGS.—(3) One end of each hoisting rope shall be well secured on the drum, and at least three laps of the same shall remain on the drum when the cage is at rest at the lowest caging place in the shaft.

The lower end of each rope shall be securely fastened to the cage by suitable sockets and chains.

INDICATOR.—(4) An index dial or indicator that plainly shows the engineer at all times the true position of the cages in the shaft.

SIGNALS.—(e) At every mine where men are hoisted and lowered by machinery there shall be provided means of signaling to and from the bottom man, the top man and the engineer. The signal system shall consist of a tube or tubes, or wire encased in wood or iron pipes, through which signals shall be communicated by electricity, compressed air or other pneumatic devices, or by ringing a bell. When compressed air or other pneumatic devices are used for signaling, provision must be made to prevent signal from repeating or reversing. The following signals shall be used at mines where signals are required:

FROM THE BOTTOM TO THE TOP.—One ring or whistle shall signify to hoist coal or the empty cage, and also to stop either when in motion.

Two rings or whistles shall signify to lower cage.

Three rings or whistles shall signify that men are coming up or going down; when return signal is received from the engineer the men shall get on the cage and the proper signal to hoist or lower shall be given.

Four rings or whistles shall signify to hoist slowly, implying danger.

Five rings or whistles shall signify accident in the mine and a call for a stretcher.

Six rings or whistles shall signify hold cage perfectly still until signaled otherwise.

From top to bottom, one ring or whistle shall signify: All ready, get on cage.

Two rings or whistles shall signify: Send away empty cage.

Provided, that the operator of any mine may, with the consent of the inspector, add to this code of signals in his discretion. The code of signals in use at any mine shall be conspicuously posted at the top and at the bottom of the shaft, and the engine room at some point in front of the engineer when standing at his post.

GAUGE.—(f) Every boiler shall be provided with a glass water gauge and not less than three try cocks and also a steam gauge, except that where two or more boilers are equipped with a steam drum properly connected with the boilers to indicate the steam pressure and without any valves between said boilers and the steam drum, the steam gauge may be placed in said steam drum; and other steam gauge shall be attached to the steam pipe in the engine house, each to be placed in such a position that the engineer and the fireman can readily see what pressure is being carried. Such steam gauges shall be kept in good order, and adjusted and be tested as often, at least, as every six months.

SAFETY VALVES.—(g) Every boiler shall be provided with a safety valve with weights or springs properly adjusted, except that where two or more boilers are equipped with a steam drum properly connected with the boilers to indicate the steam pressure and without any valves between said boilers and the steam drum, the safety valve may be placed in said steam drum.

INSPECTION OF BOILERS.—(h) All boilers used in generating steam in and about coal mines or sinking shafts shall be kept in good order, and the operator of every coal mine where steam boilers are in use shall have said boilers thoroughly examined and inspected by a competent boilermaker or other qualified person, not an employee of said operator, as often as once in every six months, and oftener if the mine inspector shall so require in writing, and the result of every such inspection shall be reported on suitable blanks to said mine inspector.

RUN-AROUND AT BOTTOM.—(i) At every underground landing where men enter or leave the cage and where men must pass from one side of the cage to the other there shall be a safe passageway, free from obstruction and dry as possible, around the shaft not less than three feet wide for the use of men only; and animals or cars shall not be taken through such passageway while men are passing or desirous of passing through such passageway.

REFUGE PLACE ON SHAFT BOTTOM.—(j) A refuge place or places for men coming out at the close of the day's work shall be provided off the main bottom of cageroom in shaft mines, at a place or places and of such size as shall be approved by the State mine inspector. Such place or places shall be not more than 400 feet from the shaft where men are hoisted, and shall be kept free from loose material. When leaving such refuge places to be hoisted out, the men shall be governed by the rules of the mine.

OBSTRUCTIONS IN SHAFT.—(k) No accumulation of ice or obstructions of any kind shall be permitted in any shaft in which men are hoisted or lowered; nor shall any dangerous gases or steam be discharged into said shaft in such quantities or at such times as to interfere with the safe passage of men. All surface or other water which flows therein shall be conducted by rings or otherwise to receptacles provided for the same in such manner as to prevent

water from falling upon men while passing into or out of the mine or while in the discharge of their duties about the shaft bottom.

INSPECTION.—(1) All shafts by which men enter or leave the mine, and the passageways leading thereto, or to the works of a contiguous mine used as an escapement shaft shall be carefully examined at least once each week that the mine is operating and the date and findings of such an examination entered promptly in the books kept at the mine for that purpose. If obstructions to the free passage of men are found, their location and nature shall be stated in said report. Such obstructions shall be promptly removed.

SEC. 11. BUILDINGS ON THE SURFACE.—(a) After the passage of this Act, all buildings and structures erected over a shaft, slope or drift mouth, and within one hundred (100) feet of the same shall be of metal, rock, clay, cement, clay or cement products, or a combination of the same. All fan houses, tops or air and escape shafts and fan drifts shall also be constructed of the above mentioned materials or a combination thereof. In connection with above construction, wood may be used only for floors, windows, doors, or the frames for the same: Provided, that this paragraph shall not apply to mines employing ten (10) men or less.

OIL AND OTHER EXPLOSIVES.—(b) No oils or similarly inflammable materials shall be stored within one hundred (100) feet of any hoisting or escapement shaft, nor in any mine.

All lubricating oil used in coal mines shall be contained in closed receptacles. In the mine, oil shall not be heated over a fire or lamp.

All explosive materials shall be stored in a fireproof magazine located on the surface not less than five hundred (500) feet from all other buildings in connection with the mine, and such magazine shall be so placed as not to jeopardize the free and safe exit of men from the mine in case of an explosion at the magazine.

ENGINE AND BOILER-HOUSE.—(c) Any building erected after the passage of this Act, for the purpose of housing the hoisting engine or boilers at any mine, shall be substantially fireproof, and no boiler-house shall be nearer than sixty feet to the main shaft or other opening, or to any building or inflammable structure connecting therewith.

SEC. 14. VENTILATION.—(a) At every coal mine there shall be provided, supplied and maintained an amount of air which shall not be less than one hundred (100) cubic feet per minute for each person, and not less than five hundred (500) cubic feet per minute for each animal in the mine, measured at the foot of the downcast and of the upcast; except that in gaseous mines there shall be not less than one hundred and fifty (150) cubic feet of air per minute for each person in the mine. The inspector shall have power by order in writing to require these quantities to be increased.

(b) The main current of air shall be so split or subdivided as to give a separate current of reasonably pure air to every 100 men at work, and the inspector shall have authority to order, in writing, separate currents for smaller groups of men, if, in his judgment, special conditions render it necessary.

(c) Doors, curtains or brattices shall be placed at such places as may be designated by the mine manager, subject to the approval of the State Inspector, to conduct into the working places an amount of air sufficient to render the working places reasonably free from deleterious air of every kind.

(d) Away from the pillar for the mine bottom, cross-cuts between entries shall be made not more than sixty feet apart without permission of the State Inspector of the district and then only in case of "faults." When such consent

is given, brattice or other means must be provided within sixty feet of the face to convey the air to the working place until a cross-cut is opened up.

When undercut or sheared, the entry, cross-cut and room-neck may be advanced concurrently, but not more than one cutting shall be shot in the room-neck until the cross-cut is finished; and after the entry has advanced fifteen feet beyond the location of the new cross-cut, only one shot shall be fired in the entry to two in either or both the cross-cut and room-neck at the same shooting time.

When not undercut or sheared, the entry and cross-cut may be advanced concurrently, but no room shall be opened in advance of the last open cross-cut, and after the entry has advanced fifteen feet beyond the location of a new cross-cut only one shot shall be fired in the entry to two in the cross-cut at the same shooting time.

Not more than three shots shall be exploded at one shooting time ahead of the last open cross-cut.

(e) After the taking effect of this Act, the first cross-cut between all rooms off any entry shall not be more than sixty (60) feet from the rib of the entry. Additional cross-cuts shall not be more than sixty (60) feet apart.

(f) All cross-cuts connecting inlet and outlet air courses, except the last one nearest the face, shall be closed with substantial stoppings to be made as nearly air-tight as possible. In the making of the air-tight partitions or stoppings, no loose material or refuse shall be used.

Cross-cuts between rooms, except the one nearest the face, shall be closed sufficiently to carry to the working places the amount of air required by law.

(g) All possible care and diligence shall be exercised in the examination of working places, especially for the investigation and detection of explosive gases therein, and where found, such gas shall be removed by a special current of air produced by bratticing or from a pipe, before men are permitted to work in such places with other lights than safety lamps.

(h) If, in any mine, the conditions are such that in the judgment of the mine manager or the judgment of the State mine inspector expressed in writing, it is necessary to use safety lamps only in working said mine, other lights shall not be used therein.

(i) The air from the outlet of the stable shall not pass into the intake air current used for ventilating the working parts of the mine.

(j) All doors in mines, used in guiding and directing the ventilating currents shall be hung and adjusted so as to close automatically.

(k) At all doors through which three or more drivers are hauling coal on any one shift, an attendant shall be employed on said shaft [shift] for the purpose of opening and closing said doors when trips of cars are passing to and from the workings: Provided, the mine inspector in case of specially dangerous conditions, shall have power to require in writing that an attendant be placed at doors through which less than three drivers shall pass. Places for shelter shall be provided at such door-ways to protect the attendants from being injured by the cars while attending to their duties: Provided, that in any or all mines, where doors are constructed in such a manner as to open and close automatically, attendants and places for shelter shall not be required.

(l) If the inspector shall find men working without the amount of air required by law, he shall at once notify the mine manager to increase the amount of air in accordance with the law. Upon the failure or refusal of the manager to act promptly, and in all cases where men are endangered by such lack of air, the inspector shall at once order the men affected out of the mine.

(m) In case the passageways, roadways or entries of any mine are so dry that the air becomes charged with dust, the operator of such mine must have such roadways regularly and thoroughly sprayed, sprinkled or cleaned.

(n) At all mines employing over one hundred (100) men underground, and in all mines generating fire damp, the ventilating fan shall be run both day and night; at all mines employing less than one hundred (100) men underground, the fan shall be run at its usual speed for six (6) hours before men go into the mine to work. A recording pressure gauge shall be maintained in connection with each fan at all times: Provided, nothing in this clause shall apply to mines employing ten men or less.

SEC. 16. CARS.—(a) When there is an open hook coupling on either end of the car, the hook and links must be attached so that when hanging down, the coupling will be clear of the ties and rails.

Mine cars in use when this Act shall become in force and effect shall be made to comply with this provision within one year thereafter.

(b) In mines opened after the passage of this Act, all mine cars shall be equipped with a bumper or bumpers on each end, which shall project from beyond the end of the car not less than four inches in length. This shall not be held to apply to mines employing ten men or less.

SEC. 18. OIL STANDARD.—(a) All illuminating oils or other illuminants used in coal mines shall conform to such specifications as shall be prescribed by the State Mining Board.

BRANDS OF OIL.—(b) All oils sold or offered for sale to be used for illuminating purposes in coal mines shall be stamped or branded upon the original barrel or package in which said oil is furnished to the person, firm or corporation selling or furnishing such oil to show that such oil has been tested and found to conform to the specifications prescribed by the State Mining Board.

PENALTY.—(c) Any person, firm or corporation, either by themselves, agents or employees, selling or offering to sell for illuminating purposes in any mine in this State any oil not complying with the specifications of the State Mining Board as suitable for illuminating purposes as contemplated in this Act, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than twenty-five dollars, nor more than one hundred dollars for each offense; and any mine owner or operator or employee of such owner or operator who shall knowingly use, or any mine operator who shall knowingly permit to be used, for illuminating purposes in any mine in this State any oil the use of which is forbidden by this Act, shall be guilty of a misdemeanor, and shall be fined not less than five dollars nor more than twenty-five dollars.

SAMPLING AND TESTING.—(d) The State mine inspectors shall have authority to sample all oil used for illuminating purposes in the mines of this State, or kept on hand for use or for sale at such mines, and for such purpose they may enter upon the premises of any person. It shall be their duty to send to the State Mining Board to be tested a sample of any oil they have reason to suspect does not comply with the specifications of the State Mining Board in regard to illuminating oil for use in mines; and if the said sample of oil is found after suitable tests not to comply with the provisions of this Act, the person using said oil or selling or offering the same for sale, shall be prosecuted in accordance with the provisions of this Act.

SEC. 19. AMOUNT OF POWDER KEPT IN MINE.—(a) No blasting powder, or other explosives, shall be stored in any coal mine, and no workman shall have at any time in the mine more than thirty-five pounds of black powder nor more than twenty-five pounds of permissible explosives, nor more than three pounds of other high explosives: Provided, that nothing in this section shall be construed

to prevent the operator of any mine from taking into the mine, when miners are not therein, and in electrically equipped mines, while the current is turned off on roadways through which it is transported, a sufficient quantity of powder for the reasonable requirements of such mine for the next succeeding working day. The delivery of powder into coal mines shall be during the interval after the shot firers have come out of the mine and prior to the entry of the day shift into the mine in the morning; but in the interim before such powder is delivered to the men, it shall be kept in a closed receptacle.

Explosives shall not be carried in the same car with tools or other materials.

PLACE AND MANNER OF KEEPING IN THE MINE.—(b) Every person who has powder or other explosives in a mine shall keep the same in a wooden box, securely locked, with hinged lid, and said box shall be kept as far as practicable from the track; and all powder boxes shall be kept as far as practicable from each other and each in a scheduled place. Black powder and high explosives or caps shall not be kept in the same box. Detonating explosives and detonators shall not be kept in the same box.

MANNER OF HANDLING.—(c) Whenever a workman is about to open a box or keg containing powder or other explosive, and while handling the same, he shall place and keep his lamp at least five feet distant from said explosive, and in such position that the air current can not convey sparks to it, and no person shall approach nearer than five feet to any open box containing an open keg of powder or other explosive with a lighted lamp, lighted pipe or other thing containing fire. No miner, workman or other person shall open any receptacle containing an explosive except by the means of opening the same provided by the manufacturer thereof, and it shall be unlawful for any person to have in his possession in any mine any receptacle containing explosive which has been opened in violation of this Act.

QUANTITY OF POWDER IN ONE CHARGE.—(d) The quantity of powder to be used in the preparation of shots shall not, in any case, exceed five (5) standard chargers full of powder in coal seams five and one-half (5½) feet or over in thickness; and shall not, in any case, exceed four (4) standard chargers full of powder in coal seams under five and one-half (5½) feet in thickness.

STANDARD CHARGER.—(e) For the purpose of determining the quantity of powder to be used in the preparation of any given shot, a standard charger is defined and prescribed to be a cylindrical metallic charger not to exceed twelve (12) inches in length and not to exceed one and one-half (1½) inches in diameter.

DEAD HOLES.—(f) No person shall drill or shoot a dead hole as hereinafter defined. A "dead hole" is a hole where the width of the shot at the point measured at right angles to the line of the hole is so great that the heel is not of sufficient strength to at least balance the resistance at that point. The heel means that part of the shot which lies outside of the powder.

In solid shooting, the width of the shot at the point, in seams of coal 6 feet or less in height, shall not be greater than the height of the coal, and in seams of coal more than 6 feet in thickness, the width of the shot at the point shall, in no case, be more than 6 feet.

In undercut coal, no hole shall be drilled "on the solid" for any part of its length.

MIXED SHOTS.—(g) In no case shall more than one kind of explosive be used in the same drill hole.

COPPER TOOLS.—(h) The needle used in preparing a blast shall be made of copper, and any metallic tamping-bar or scraper which is used for placing explosives for shots shall be tipped with at least five (5) inches of copper. A scraper shall not be used for tamping.

TAMPING.—(i) Every blasting hole shall be tamped full from the explosive to the mouth of the hole, and no coal dust or any material that is inflammable or that may create a spark, whether the same shall be wet or dry, shall be used for tamping.

USE OF SQUIBS.—(j) When a squib is used to fire a shot it shall be unlawful to shorten or oil the match of the squib or to ignite it except at the end.

WARNING BEFORE FIRING.—(k) Before firing a shot, the person firing the same shall see that all persons are out of danger from the probable effects of such shot, and shall take measures to prevent any one approaching by shouting "fire" before lighting the same.

NOT MORE THAN ONE SHOT AT A TIME.—(l) Not more than one shot shall be lighted at the same time in any working place unless the firing is done by electricity or by fuses of such length that the interval between the explosions of any two shots shall be not less than one minute, and in no case shall any shot or shots be fired or lighted which are termed depending or dependent shots, until after the expiration of ten minutes from the successful firing of the relieving shot or shots. When successive shots are to be fired in any working place in which the roof is broken or faulty, the smoke shall be allowed to clear away and the roof examined and made secure between shots.

MISSSED SHOTS.—(m) No person shall return to a missed shot, if lighted with a squib, until five (5) minutes have elapsed from the time of lighting the same, or, if lighted with fuse, until the following day; and no person shall return to a missed shot when the firing is done by electricity unless the wires are disconnected from the battery.

(n) No missed shot shall be withdrawn excepting by the use of copper tipped or wooden tools.

SEC. 20. (a) It shall be the duty of the mine manager :

1. To visit each working place in the mine at least once in two weeks.
2. To provide a suitable checking system whereby the entrance into and departure from the mine of each employee shall be indicated.
3. To have the underground workings of the mine examined by a certificated mine examiner within eight hours preceding every day upon which the mine is to be operated. Such a mine examiner shall make the examination as provided in this Act, and he shall enter his report thereof with indelible pencil or ink in a well bound or properly protected loose leaf book provided for that purpose, before the men are permitted to enter the mine in the morning. This book shall be kept in some convenient place on top, but not in the engine room, for the information of the inspector and other persons interested therein.
4. To examine the mine examiner's report in the morning, and if the working places are reported dangerous, he shall withhold the entrance checks of men working in such places until he has taken every proper precaution to advise such men of the danger and instructed them not to work in such places until the reported danger has been removed, except for the purpose of removing same.
5. When there is to be a night shift mining coal, the mine manager shall require the places in which such night shift are expected to work to be examined for gas, or falls or dangerous roof, by the person in charge of such night shift or some competent person duly authorized by him before the men enter such places for work. The night shift may go into the mine while the night examiner is in the mine, excepting in mines where marsh gas has been detected in dangerous quantities, provided they do not go into the working places until the required examination is made.

Certificated mine examiners shall not be required for the examination preceding the night shift, excepting in mines where marsh gas is detected in dan-

gerous quantities. The night examiner, or examiners, shall make a record of their examination in a special book kept for that purpose, which shall be kept in some convenient place on top when not in use by the examiner.

6. He shall provide a sufficient number of props, caps and timbers, when demanded, delivered on the miners' cars at the usual place, in suitable lengths and dimensions for the securing of the roof by the miners.

7. He shall see that the cross-cuts are made at proper distances apart, and that the necessary doors, curtains, and brattices are provided to secure the men in the mine the volume of air required by this Act, or by the written demands of the mine inspector; also, that all stoppings along air-ways are properly and promptly built.

8. He shall keep careful watch over all ventilating apparatus, and the air currents in the mine, and in case of accident to fan or machinery by which the air currents are stopped or materially obstructed, he shall at once order the withdrawal of the men from the mine and prohibit their return until the required ventilation has been reestablished.

9. He shall measure the air current or cause the same to be measured at least once each week at the inlet and outlet, and shall keep a record of such measurements for the information of the mine inspector.

10. He or his assistants shall, at least once a week, examine the roadways leading to the escapement shaft or other openings for the safe exit of men to the surface; and shall make a record of any obstructions or other unsafe conditions existing therein, and cause the same to be promptly removed.

11. He shall examine or designate a competent person to examine the hoisting ropes, cages, and safety catches every morning, and shall require the ropes to be tested by hoisting the cages before the men are lowered.

12. He must see that the top man and bottom man are on duty and that sufficient lights are maintained at the top and bottom landings when the miners are being hoisted and lowered.

13. The mine manager or his assistant shall be at his post at the mine when the men are lowered into the mine in the morning for work, and shall remain at night until all the men employed during the day shall have been hoisted out.

14. He shall give special attention to and instructions concerning the proper storage and handling of explosives in the mines.

15. He shall see that all dusty haulage roads are regularly and thoroughly sprayed, sprinkled or cleaned at regular intervals when the health and safety of the men in the mine demand.

(b) The mine manager shall have power:

1. To instruct employees as to their respective duties and to require of all employees obedience to the provisions of the mining law.

2. To prescribe special rules concerning the proper storage and handling of explosives in the mine and concerning the time and manner of placing and discharging the blasting shots, and it shall be unlawful for any miner to fire shots except according to such rules.

3. In mines in which the works are so extensive that all the duties devolving upon the mine manager cannot be discharged by one man, competent persons may be designated and appointed as assistants to the mine manager, who shall exercise his functions under the mine managers' instructions.

SEC. 21. CERTIFICATED MINE EXAMINERS.—(a) A certificated mine examiner shall be required at all coal mines. There shall be one or more additional certificated mine examiners whenever required in writing by the State mine inspectors when the conditions are such as to make the employment of such additional mine examiners necessary.

(b) It shall be the duty of the mine examiner:

1. To examine the underground workings of the mine within eight hours preceding every day upon which the mine is to be operated.

2. When in the performance of his duties, to carry with him a safety lamp in proper order and condition and a rod or bar for sounding the roof.

3. To see that the air current is traveling in its proper course and in proper quantity; and to measure with an anemometer the amount of air passing in the last cross-cut or break-through of each pair of entries, or in the last room of each division in long-wall mines, and at all other points where he may deem it necessary; and to note the result of such measurements in the mine examiner's book kept for that purpose.

4. To inspect all places where men are required in the performance of their duties to pass or to work, and to observe whether there are any recent falls or dangerous roof or accumulations of gas or dangerous conditions in rooms or roadways; and to examine especially all roadways leading to escapement shafts or other openings for the safe exit of men to the surface, the edges and accessible parts of recent falls and old gobs, and air-courses.

5. As evidence of his examination of said rooms and roadways, to inscribe in some suitable place on the walls of each, not on the face of the coal, with chalk, the month and the day of the month of his visit.

6. When working places are discovered in which there are recent falls or dangerous roof or dangerous conditions, to place a conspicuous mark or sign thereat as notice to all men to keep out; and in case of accumulation of gas, to place at least two conspicuous obstructions across the roadway not less than twenty feet apart, one of which shall be outside the last open cross-cut.

7. Upon completing his examination, to make a daily record of the same in a book kept for that purpose, for the information of the company, the inspector and all other persons interested; and this record shall be made each morning before the miners are permitted to enter the mine.

8. To take into his possession the entrance checks of all men whose working places have been shown by his examination and record to be dangerous, and to give such entrance checks to the mine manager before the men are permitted to enter the mine in the morning.

SECOND AMENDATORY ACT.

LAWS 1915, P. 505.

JUNE 22, 1915.

AN ACT to amend sections 2, 3, 5, 6, 7, 9, 10, 15, 21 and 25 of an Act entitled, "An Act," etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 2, 3, 5, 6, 7, 9, 10, 15, 21 and 25 of an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, approved June 26, 1913, in force July 1, 1913, be and the same are hereby amended so as to read as follows:

NOTE.—The amended sections 2, 3, 5, and 6 are under the title, *Miners' Examining Board—State Mining Board*. See page 84.

SEC. 7. MAPS REQUIRED.—(a) The operator of every coal mine in the State shall make, or cause to be made, an accurate map of plan of such mine, drawn to a scale not smaller than 200 feet to the inch. All measurements shall be in feet and decimals of a foot. On such maps shall appear the name of the State, county and township in which the mine is located, the designation of the mine, the name of the company or owner, the certificate of the mining

engineer or surveyor as to the accuracy and date of the survey, the north point and the scale to which the drawing is made.

SURFACE SURVEY.—(b) Such map or plan shall accurately show the surface boundary lines of the coal rights pertaining to each mine, and all sections or quarter-section lines or corners within the same; the lines of town lots and streets; the tracks and side-tracks of all railroads and the location of all wagon roads, rivers, streams, ponds, location and depth of holes drilled for oil, gas or water that penetrate a workable coal seam, and the elevation above the coal seam of any stream or body of water that might endanger the mine.

UNDERGROUND SURVEY.—(c) For the underground workings, said maps shall show all shafts, slopes, tunnels or other openings to the surface or to the workings of a contiguous mine; all excavations, entries, rooms and cross-cuts; the location of the fan or furnace and the direction of the air currents; the location of pumps, hauling engines, engine planes, abandoned works, fire walls and standing water; and the outcrop line of the seam, if any, on the property. The general outline of all areas in which pillars have been drawn shall be indicated on the map. Each underground map also shall show, in feet and decimals thereof, the elevation of the floor of the coal at reasonable intervals on the main entries and cross entries from the bottom of the shaft to the face of the workings; such elevations shall be referred to the floor of the coal at the bottom of the hoisting shaft.

MAP FOR EVERY SEAM.—(d) A separate and similar map, drawn to the same scale, shall be made of each and every seam, which, after the passage of this Act, shall be worked in any mine, and the maps of all such seams shall show all shafts, inclined planes or other passageways connecting the same.

SEPARATE MAP FOR THE SURFACE.—(e) A separate map also shall be made of the surface whenever the surface buildings, lines or objects are so numerous as to obscure the details of the mine workings if drawn upon the same sheet with them, and in such case the surface map shall be drawn on transparent cloth or paper, so that it can be laid upon the map of the underground workings, and thus indicate the relation of lines and objections on the surface to the excavations of the mine.

THE DIP.—(f) Each map shall also show by profile drawing and measurements, in feet and decimals thereof, the rise and dip of the seam from the bottom of the shaft in either direction to the face of the workings.

COPIES FOR INSPECTORS AND RECORDERS.—(g) The original or true copies of all such maps shall be kept in the office at the mine, and one true copy thereof shall be furnished to the State inspector of mines for the district in which said mine is located, and one shall be filed in the office of the recorder of the county in which the mine is located, within thirty days after the completion of the same. The maps so delivered to the inspector and to the recorder shall remain in the custody of said inspector and recorder during their respective terms of office, and be delivered by them to their successors in office. They shall be kept at the office of the inspector and of the recorder, and be open to the examination of all persons interested in the same, but such examination shall be made only in the presence of the inspector or the recorder. Neither the inspector nor the county recorder shall permit any copies of the same to be made without the written consent of the operator or the owner of the property.

The county recorder shall properly index such map as part of the title record of the property affected. A copy of each map and extensions to the same shall be furnished the mine rescue station commission for use in connection with rescue work only.

ANNUAL SURVEYS.—(h) An extension of the last preceding survey of every mine in active operation shall be made once in every twelve months prior to July 1, of every year, and the results of said survey, with the date thereof shall be promptly and accurately entered upon the original maps and all copies of the same, so as to show all changes in plan or new work in the mine, and all extensions of the old workings to the most advanced face or boundary of said workings which have been made since the last preceding survey. The State inspector, the county recorder and the rescue station commission shall be furnished with a copy of the said extended map or of the extensions to said map.

ABANDONED MINES.—(i) When any coal mine is worked out or is about to be abandoned or indefinitely closed, the operator of the same shall make, or cause to be made, a final survey of such mine; to show the entire worked out area when the mine was closed, and the results of the same shall be duly extended on all maps of the mine and copies thereof herein required to be filed. The shaft, slope or drift openings into any such abandoned mine shall be kept securely enclosed.

NOTE.—Clauses (j) and (k) are under the appropriate headings on page 50.

SEC. 9. TWO PLACES OF EGRESS.—(a) For every coal mine in this State, whether worked by shaft, slope or drift, there shall be provided and maintained, in addition to the hoisting shaft, or other place of delivery, an escapement shaft or opening to the surface, or an underground communicating passageway with a contiguous mine, so that there shall be at least two distinct and available means of egress to all persons employed in such coal mines.

DISTANCE FROM MAIN SHAFT.—(b) In mines sunk after the passage of this Act, the first escapement shaft shall be separated from the main shaft by such extent of natural strata as may be agreed upon by the inspector of the district and the owner of the property, but the distance between the main shaft and the escapement shaft shall not be less than 500 feet nor more than 2,000 feet: Provided, that in mines employing ten (10) men or less (,) the distance between the hoisting shaft and the escapement shaft shall not be less than two hundred and fifty (250) feet.

UNLAWFUL TO EMPLOY MORE THAN TEN MEN.—(c) It shall be unlawful to employ underground, at any one time, more men than in the judgment of the inspector are necessary to complete speedily the connections with the escapement shaft or adjacent mine; and said number must not exceed ten men at any one time for any purpose in said mine until such escapement or connection is completed. The time allowed for completing such escapement shaft or making such connections with an adjacent mine, as is required by the terms of this Act, shall be three months for shafts 200 feet or less in depth, and six months for shafts less than 500 feet and more than 200 feet, and nine months for all other mines, slopes or drifts, or connections with adjacent mines. The time to date in all cases from the hoisting of coal from the hoisting shaft: Provided, that in mines employing ten (10) men or less, the time for completing the escapement shaft shall not be more than six months from the time of hoisting coal.

STAIRWAYS OR CAGES.—(d) The escapement shaft at every mine opened after the passage of this Act shall be equipped with a substantial stairway, set at an angle not greater than forty-five degrees, which shall be provided with handrails, and with platforms or landings at each turn of the stairway. If any escapement shaft, at the time of the passage of this Act, be equipped with a cage for hoisting men, such shaft, cage and all equipment used in connection therewith must conform to the requirements of this Act in reference to the

hoisting and lowering of men. Where an escapement way is connected to a compartment in which coal is hoisted in such manner that men using the escapement way are endangered by falling coal or by themselves falling into such hoisting compartment, the State mine inspector shall have power to order suitable protection against such dangers.

PASSAGEWAYS TO ESCAPEMENT.—(e) Such escapement shaft or opening or communication with a contiguous mine as aforesaid, shall be constructed in connection with every seam of coal worked in such mine, and all passageways communicating with the escapement shaft or place of exit, from the main hauling ways to said place of exit, shall be maintained free of obstruction at least 5 feet high and 5 feet wide. Such passageways must be so graded and drained that it will be impossible for water to accumulate in any depression or dip of the same in quantities sufficient to obstruct the free and safe passage of men. No passageway to an escapement shaft shall pass through a stable. At all points where the passageway to the escapement shaft or other place of exit is interested by other roadways or entries, conspicuous signboards shall be placed, indicating the direction it is necessary to take in order to reach such place of exit.

COMMUNICATIONS WITH ADJACENT MINES.—(f) When operators of adjacent mines have, by agreement, established underground communications between said mines as an escapement outlet for the men employed in both, the intervening doors shall remain unlocked and ready at all times for immediate use. When such communication has once been established between contiguous mines, the operator of either shall not close the same without the consent of the operator of the contiguous mine and of the State inspector for the district: Provided, that when either operator desires to abandon mining operations the expense and duty of maintaining such communication shall devolve upon the party continuing operations and using the same.

SEC. 10. GATES AT LANDINGS.—(a) The upper and lower landing at the top of each shaft, and the opening of each intermediate seam from or to the shaft, shall be kept clear and free from loose materials, and shall be protected with automatic or other gates, such gates to be of good, serviceable construction for the purpose for which they are designed, namely, to prevent either men or materials from falling into the shaft. At the top landing cage supports, where necessary, must be carefully set and adjusted so as to securely hold the cage when at rest.

LIGHTS ON LANDINGS.—(b) Whenever the hoisting or lowering of men occurs before daylight or after dark, or when the landing at which men take or leave the cage is at all obscured by steam or otherwise, there must always be maintained at such landing a light sufficient to show the landing and surrounding objects distinctly. Likewise, as long as there are men underground in any mine the operator shall maintain a good and sufficient light at the bottom of the shaft thereof, so that persons coming to the bottom may clearly discern the cage and objects in the vicinity.

HOISTING EQUIPMENT.—(c) Every shaft in which men are hoisted and lowered must be equipped with a cage, or cages, fitted to guide-rails running from the top to the bottom. Said cages must be safely constructed; they must be furnished with sheet-metal covers adequate to protect persons riding thereon from falling objects; they must be equipped with safety catches. Every cage on which persons are carried must be fitted with iron bars or rings in proper place and sufficient number to furnish a secure hand-hold for every person permitted to ride thereon. There shall be attached to every cage on which men are, or may be, hoisted or lowered, a horn or other device with which signals can be

given on the cage. Hoisting ropes when socketed at the cage shall be cut off and resocketed at least once each six months and a notice shall be posted in the engine room giving the date when the rope was installed and when resocketed.

(d) In connection with every hoisting engine used for hoisting or lowering of men there shall be provided as follows:

BRAKE OR DRUM.—(1) A good and sufficient brake on the drum, so adjusted that it may be operated by the engineer without leaving his post at the levers.

FLANGES.—(2) Flanges attached to the sides of the drum, with a distance when the whole rope is wound on the drum of not less than 4 inches between the outer layer of rope and the greatest diameter of the flange.

ROPE FASTENINGS.—(3) One end of each hoisting rope shall be well secured on the drum, and at least three laps of the same shall remain on the drum when the cage is at rest at the lowest caging place in the shaft.

The lower end of each rope shall be securely fastened to the cage by suitable sockets and chains.

INDICATOR.—(4) An index dial or indicator that plainly shows the engineer at all times the true position of the cages in the shaft.

SIGNALS.—(e) At every mine when men are hoisted and lowered by machinery there shall be provided means of signaling to and from the bottom man, the top man and the engineer. The signal system shall consist of a tube or tubes, or wire encased in wood or iron pipes, through which signals shall be communicated by electricity, compressed air or other pneumatic devices, or by ringing a bell. When compressed air or other pneumatic devices are used for signaling, provision must be made to prevent signal from repeating or reversing. The following signals shall be used at mines where signals are required:

FROM THE BOTTOM TO THE TOP.—One ring or whistle shall signify to hoist coal or the empty cage, and also to stop either when in motion.

Two rings or whistles shall signify to lower cage.

Three rings or whistles shall signify that men are coming up or going down; when return signal is received from the engineer the men shall get on the cage and the proper signal to hoist or lower shall be given.

Four rings or whistles shall signify to hoist slowly, implying danger.

Five rings or whistles shall signify accident in the mine and a call for a stretcher.

Six rings or whistles shall signify hold cage perfectly still until signaled otherwise.

FROM TOP TO BOTTOM, one ring or whistle shall signify: All ready, get on cage.

Two rings or whistles shall signify: Send away empty cage.

Provided, that the operator of any mine may, with the consent of the inspector, add to this code of signals in his discretion. The code of signals in use at any mine shall be conspicuously posted at the top and at the bottom of the shaft, and the engine room at some point in front of the engineer when standing at his post.

GAUGE.—(f) Every boiler shall be provided with a glass water gauge and not less than three try cocks and also a steam gauge, except that where two or more boilers are equipped with a steam drum properly connected with the boilers to indicate the steam pressure and without any valves between said boilers and the steam drum, the steam gauge may be placed in said steam drum; and other steam gauge shall be attached to the steam pipe in the engine house, each to be placed in such a position that the engineer and the fireman can readily see what pressure is being carried. Such steam gauges shall be kept in good order, and adjusted and be tested as often, at least, as every six months.

SAFETY VALVES.—(g) Every boiler shall be provided with a safety valve with weights or springs properly adjusted, except that where two or more boilers are equipped with a steam drum properly connected with the boilers to indicate the steam pressure and without any valves between said boilers and the steam drum, the safety valves may be placed in said steam drum.

INSPECTION OF BOILERS.—(h) All boilers used in generating steam in and about coal mines or sinking shafts shall be kept in good order, and the operator of every coal mine where steam boilers are in use shall have said boilers thoroughly examined and inspected by a competent boilermaker or other qualified person, not an employee of said operator, as often as once in every six months, and oftener if the mine inspector shall so require in writing, and the result of every such inspection shall be reported on suitable blanks to said mine inspector.

RUN-AROUND AT BOTTOM.—(i) At every underground landing where men enter or leave the cage and where men must pass from one side of the cage to the other there shall be a safe passageway, free from obstruction and dry as possible, around the shaft not less than three feet wide for the use of men only; and animals or cars shall not be taken through such passageway while men are passing or desirous of passing through such passageway.

REFUGE PLACE ON SHAFT BOTTOM.—(j) A refuge place or places for men coming out at the close of the day's work shall be provided off the main bottom of cageroom in shaft mines, at a place or places and of such size as shall be approved by the State mine inspector. Such place or places shall be not more than 400 feet from the shaft where men are hoisted, and shall be kept free from loose material. When leaving such refuge places to be hoisted out, the men shall be governed by the rules of the mine.

OBSTRUCTION IN SHAFT.—(k) No accumulation of ice or obstructions of any kind shall be permitted in any shaft in which men are hoisted or lowered; nor shall any dangerous gases or steam be discharged into said shaft in such quantities or at such times as to interfere with the safe passage of men. All surface or other water which flows therein shall be conducted by rings or otherwise to receptacles provided for the same in such manner as to prevent water from falling upon men while passing into or out of the mine or while in the discharge of their duties about the shaft bottom.

INSPECTION.—(l) All shafts by which men enter or leave the mine, and the passageways leading thereto, or to the works of a contiguous mine used as an escapement shaft shall be carefully examined throughout at least once each week that the mine is operating and the date and findings of such an examination entered promptly in the books kept at the mine for that purpose. A daily visit to the bottom of all such escapement shafts shall be made by the mine examiner, and if obstructions to the free passage of men are found, their location and nature shall be stated in such report. Such obstructions shall be promptly removed.

SEC. 15. REFUGE PLACES—POWER HAULAGE ROADS.—(a) On all singletrack haulage roads, where hauling is done by machinery, which roads the persons employed in the mine must use while performing their work or travel on foot to and from their work, there shall be places of refuge on one side not less than 3 feet in depth from the side of the car, and not less than 4 feet long and 5 feet in height and not more than 60 feet apart. On all such roads constructed after the passage of this Act, the refuge places shall be placed on the opposite side from the electric power wire. On rope-haulage roads, means of signaling shall be established between the haulage engineer and all points on the road. A conspicuous light shall be carried on the front, and a gong,

conspicuous red light or white signal board on the rear of every trip or train of pit cars moved by machinery.

REFUGE PLACES—MULE ROADS.—(b) On all haulage roads on which the haulage is done by draft animals, whereon men are obliged to be in the performance of their duties or have to pass to and from their work, there shall be places of refuge not less than 2½ feet in width from the side of the car, and not less than 4 feet long and 5 feet in height and not more than 60 feet apart.

ROOM-NECKS AS REFUGE PLACES.—(c) Refuge places shall not be required in entries on which room-necks at regular intervals not exceeding 60 feet furnish the required refuge places.

KEEPING REFUGE PLACES CLEAR.—(d) All places of refuge must be kept clear of obstructions and no material shall be stored nor allowed to accumulate therein. They shall also be whitewashed not less than once in six months.

GOB ON HAULAGE ROADS.—(e) One side of all haulage roads shall be kept clear of refuse or materials, except timbering, unless the rib or timbering on such side shall be 2½ feet or more from the rail. But in such case materials or refuse shall not be permitted within 2½ feet of the rail.

SEC. 21. CERTIFICATED MINE EXAMINERS.—(a) A certificated mine examiner shall be required at all coal mines. There shall be one or more additional certificated mine examiners whenever required in writing by the State mine inspectors when the conditions are such as to make the employment of such additional mine examiners necessary.

(b) It shall be the duty of the mine examiner:

1. To examine the underground workings of the mine within eight hours preceding the time the day shift goes on duty, every day upon which the mine is to be operated, excepting that when in the judgment of the State mine inspector expressed in writing to the coal operator, a mine generates explosive gas in dangerous quantities, a State mine inspector shall require the mine to be examined for gas in such manner and at such shorter intervals than eight hours before the time the day shift goes on duty every day upon which the mine is to be operated, as may be necessary to ensure the safety of the men working in such mine.

2. When in the performance of his duties, to carry with him a safety lamp in proper order and condition and a rod or bar for sounding the roof.

3. To see that the air current is traveling in its proper course and in proper quantity; and to measure with an anemometer the amount of air passing in the last cross-cut or break-through of each pair of entries, or in the last room of each division in long-wall mines, and at all other points where he may deem it necessary; and to note the result of such measurements in the mine examiner's book kept for that purpose.

4. To inspect all places where men are required in the performance of their duties to pass or to work, and to observe whether there are any recent falls or dangerous roof or accumulations of gas or dangerous conditions in rooms or roadways; and to examine especially all roadways leading to escapement shafts or other openings for the safe exit of men to the surface, the edges and accessible parts of recent falls and old gobs and air-courses.

5. As evidence of his examination of said rooms and roadways, to inscribe in some suitable place on the walls of each, not on the face of the coal, with chalk, the month and the day of the month of his visit.

6. When working places are discovered in which there are recent falls or dangerous roof or dangerous conditions, to place a conspicuous mark or sign thereat as notice to all men to keep out; and in case of accumulation of gas, to place at least two conspicuous obstructions across the roadway not less than twenty feet apart, one of which shall be outside the last open cross-cut.

7. Upon completing his examination to make a daily record of the same in a book kept for that purpose, for the information of the company, the inspector and all other persons interested; and this record shall be made each morning before the miners are permitted to enter the mine.

8. To take into his possession the entrance checks of all men whose working places have been shown by his examination and record to be dangerous, and to give such entrance checks to the mine manager before the men are permitted to enter the mine in the morning.

SEC. 25. DUTY OF INSPECTOR.—(a) Any loss of life or personal injury in or about any coal mine shall be reported without delay by the person having charge of said mine to the State mine inspector of the district in which the mine is located, and the said inspector, in case of injury, if he deem necessary from the facts reported, and in all cases of loss of life, shall go immediately to the scene of said accident and render every possible assistance to those in need.

Every operator of a coal mine shall make or cause to be made and preserve for the information of the State mine inspector, upon uniform blanks furnished by said inspector, a record of all deaths and all injuries sustained by any of his employees in the pursuance of their regular occupations.

CORONER'S INQUEST.—(b) If any person is killed in or about a mine, the operation shall also notify the coroner of the county or in his absence or inability to act, any justice of the peace of said county who shall hold an inquest concerning the cause of such death. The State mine inspector may question or cross-question any witness testifying at the inquest.

INVESTIGATION BY INSPECTOR.—(c) The State mine inspector shall make a personal investigation as to the nature and cause of all serious accidents in mines under his supervision. He shall make a record of the circumstances attending the same, as developed by the coroner's inquest, and by his own personal investigation, which record shall be preserved in the files of his office, and a copy thereof filed with the State Mining Board within thirty days from the conclusion of such investigation, and such report shall thereupon become part of the record of such board. To enable him to make such investigation he shall have power to compel the attendance of witnesses and to administer oaths or affirmations, to them, and the cost of such investigation shall be paid by the county in which such accident has occurred.

Any person having charge or custody of the records, files, documents, reports and proceedings of the State Mining Board provided to be made, filed or kept under the provisions of the laws of Illinois, in case of serious accident shall furnish to any person or persons interested, a certified copy thereof upon application, and upon the payment or tender of fees at such rates as are now paid in this State to the clerks of circuit courts in counties of the second class for certified copies of records, and refusal to furnish such copies shall constitute a misdemeanor.

ANNOTATIONS.

NOTE.—These annotations cover the general revision act of 1899, all acts amendatory thereof, the revised mining act of 1911, and the amendatory act of 1915. The annotations cover the parts of the statutes included under the titles: Mine Inspectors; Mine Managers; and Miners' Examining Boards. See pages 48, 54, 62, 92.

1. STATUTE ENACTED PURSUANT TO CONSTITUTION.
2. MINING HAZARDS—LEGISLATION—CLASSIFICATION.
3. CONSTITUTIONALITY OF STATUTE—POLICE POWER OF STATE.
4. PURPOSE OF STATUTE.
5. CONSTRUCTION AND AMENDMENT.
6. MINE—MEANING—APPLICATION OF STATUTE.

7. MINER—MEANING—APPLICATION OF STATUTE.
8. SHAFT—MEANING—DUTY TO MAINTAIN.
9. INSPECTION—EXTENT OF EXAMINATION—COMPLIANCE WITH STATUTE.
10. MINE OPERATORS—DUTIES GENERALLY—GOOD FAITH.
11. DUTY OF MINE OPERATOR TO ADOPT AND POST RULES.
12. DUTY OF OPERATOR TO EMPLOY MINE MANAGER OR EXAMINER.
13. ASSISTANT MINE MANAGER—EMPLOYMENT.
14. MINE MANAGERS AND EXAMINERS—DUTIES.
15. DELEGATION OF DUTIES—POWER TO EXEMPT FROM LIABILITY.
16. VICE PRINCIPAL—MANAGER AND EXAMINER.
17. COMPETENCY OF MINE EXAMINER—EFFECT OF CERTIFICATE.
18. MINE EXAMINER—RIGHT TO PROTECTION OF STATUTE.
19. LIABILITY AND NON-LIABILITY OF OPERATOR—INSTANCES.
20. DUTY OF OPERATOR—MINER MAY ASSUME PERFORMANCE.
21. HOISTING ENGINEERS—DUTY TO EMPLOY—RIGHT TO DISCHARGE.
22. HOISTING MACHINERY—DUTY—CARE REQUIRED—LIABILITY.
23. SIGNALS—ADDITIONS BY OPERATOR.
24. FENCING SHAFT AND LANDINGS—GATES AND CAGES.
25. LIGHTING SHAFT—DUTY AND LIABILITY—QUESTION OF FACT.
26. LIGHTING SHAFT—LANDING—MEANING.
27. HAULAGEWAYS—DUTY AND LIABILITY OF OPERATOR.
28. REFUGE PLACES—MEANING OF REQUIREMENT—DUTY AND LIABILITY.
29. LIGHTS ON MOTORS AND CARS.
30. PROPS—DUTY OF OPERATOR TO FURNISH—LIABILITY FOR FAILURE.
31. PROPS—DUTY OF MINER TO REQUEST AND SET.
32. PROPS—SUFFICIENCY OF REQUEST—CUSTOM.
33. VENTILATION.
34. DOORS—DUTY TO EMPLOY ATTENDANTS—GOOD FAITH.
35. DOORS—PERMANENT, PRINCIPAL OR TEMPORARY—MEANING.
36. DOOR ATTENDANTS REQUIRED—PURPOSE OF STATUTE.
37. CROSS-CUTS—PURPOSE—FAILURE TO MAKE—LIABILITY.
38. EMPLOYMENT OF BOYS—REPEAL—CHANGE OF AGE.
39. FAILURE TO INSTRUCT OR WARN—LIABILITY.
40. FELLOW SERVANTS—INSTANCES.
41. DANGEROUS CONDITIONS OR PLACES—MEANING—DUTY TO MARK—PLEADING.
42. DANGEROUS CONDITIONS—PLACES ABOVE GROUND.
43. DANGEROUS CONDITIONS—ELECTRICAL APPLIANCES—EXCESSIVE VOLTAGE.
44. DANGEROUS CONDITIONS—DETERMINATION—GOOD FAITH.
45. DANGEROUS CONDITIONS—KNOWLEDGE OR WANT OF KNOWLEDGE—CARE REQUIRED.
46. DANGEROUS CONDITIONS—MARKING—WHAT CONSTITUTES.
47. DANGEROUS CONDITIONS—FAILURE TO MARK—LIABILITY.
48. DANGEROUS CONDITIONS—MARKING NOT REQUIRED.
49. DANGEROUS PLACES—RECORD—WHAT CONSTITUTE.
50. DANGEROUS CONDITIONS—WORK UNDER MINE MANAGER—MEANING.
51. DANGEROUS CONDITIONS—CHANGES IN ACT 1911.
52. DUTIES IMPOSED ON MINERS.
53. MINER'S WORKING PLACE—DANGER—RECOVERY FOR INJURY.
54. MINER MAKING DANGEROUS PLACE SAFE—RECOVERY FOR INJURY.
55. MINER WITHIN SCOPE OF EMPLOYMENT.
56. SHOT FIRERS—APPLICATION OF STATUTE.
57. COMPLIANCE WITH STATUTE—LIABILITY FOR FAILURE.
58. WILFUL VIOLATION OF STATUTE—WHAT CONSTITUTES.

59. WILFUL VIOLATION—GOOD FAITH—EXCUSE.
60. WILFUL FAILURE OF MINE MANAGER TO OBEY STATUTE—LIABILITY OF OPERATOR.
61. VIOLATION OF STATUTE—PROXIMATE CAUSE OF INJURY.
62. VIOLATION OF STATUTE—FAILURE TO SHOW PROXIMATE CAUSE—INSTANCES.
63. VIOLATION OF STATUTE—CONCURRING OR CONTRIBUTORY CAUSE OF INJURY.
64. VIOLATION OF STATUTE—PROOF AND PRESUMPTIONS.
65. VIOLATION OF STATUTE AND NEGLIGENCE—DISTINCTION.
66. NEGLIGENCE OF OPERATOR—STATUTORY AND COMMON LAW LIABILITY.
67. EMPLOYMENT OF BOYS—CONSTRUCTION AND PURPOSE OF ACT.
68. ACTION BY INJURED MINER—PLEADING AND PROOF—RECOVERY.
69. ACTION BY INJURED MINER—INSTRUCTIONS BY COURT.
70. ACTION FOR DEATH—RIGHT TO SUE—WIDOW OR DEPENDENTS.
71. ACTION FOR DEATH—MEASURE OF DAMAGES—PROOF.
72. ACTION FOR DEATH—PROOF OF DEPENDENCE.
73. ACTION FOR DEATH—PARTIES—CHANGE IN STATUTE.
74. ACTION FOR DEATH—LIMITATION.
75. CAUSE OF ACTION SAVED.
76. CONTRIBUTORY NEGLIGENCE—DEFENSE ABROGATED.
77. CONTRIBUTORY NEGLIGENCE—MINER'S VIOLATION OF DUTY.
78. ASSUMPTION OF RISK—RISKS ASSUMED BY MINER.
79. ASSUMPTION OF RISK—RISKS NOT ASSUMED BY MINERS.
80. PROOF OF SIMILAR ACTS—ADMISSIBILITY.
81. EXPERT EVIDENCE—ADMISSIBILITY—INSTANCES.
82. QUESTIONS OF FACT—INSTANCES.
83. DAMAGES—SINGLE RECOVERY.

1. STATUTE ENACTED PURSUANT TO CONSTITUTION.

The statute of 1899, entitled "An act to revise the law in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," was enacted in compliance with the constitutional duty imposed upon the legislature by section 29 article 4 of the constitution of 1870.

Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 217.

The mining statutes were enacted in obedience to the constitutional mandate and the mining act can not be held to be unconstitutional because it applies to conditions common to other occupations. The purpose of the constitutional amendment was to place mining laws in a class to themselves, and such laws when enacted should be liberally construed for the protection of miners.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41;

Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 198;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 376.

The act of 1911, like the former mines and miners' act, was passed in obedience to the statutory mandate.

Havron v. Shoal Creek Coal Co., 184 Ill. App. 117, p. 119.

This act was passed under a mandate of the constitution making it the duty of the legislature to pass laws for protection of operative miners. It grew out of the public wish that every precaution should be taken against the unusual hazards and dangers incident to the inhabitancy of mines, and was in-

tended to protect with all known expediency every person whose occupation required him to labor in these subterranean rooms and roadways.

Fulton v. Wilmington Star Min. Co., 133 Federal 193.

See Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 65.

The general assembly has carried out the constitutional requirement and from time to time has legislated for the protection of miners.

Wilmington Star Min. Co. v. Fulton, 205 U. S. 60, p. 71;

Fulton v. Wilmington Star Min. Co., 133 Federal 193, p. 197.

2. MINING HAZARDS—LEGISLATION—CLASSIFICATION.

The general assembly may classify persons for the purpose of legislation provided the classification is not arbitrarily made and is based upon some difference which appears to have a just and proper relation to the classification. Operative coal miners are placed in a class by themselves by the constitution itself, and the validity of laws enacted to provide for their health and safety can not be disputed. They are exposed by their occupation to extraordinary hazards and perils to which other laborers are not exposed.

Rogers v. St. Louis-Carterville Coal Co., 254 Ill. 104, p. 109.

The conditions and hazards under which the transportation of coal in a mine is conducted are different from the conditions prevailing in transportation elsewhere, and men engaged in such occupation constitute a class by themselves.

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 310.

3. CONSTITUTIONALITY OF STATUTE—POLICE POWER OF STATE.

This act does not deny to the mine operator the equal protection of laws, nor does it take their property without due process of law in violation of the Federal Constitution.

Consolidated Coal Co. v. People, 186 Ill. 134;

Commonwealth v. Plymouth, 232 Pa. St. 141, p. 148.

Every precaution should be taken against the unusual hazards and dangers incident to the inhabitancy of mines. It was intended by the act of 1899 to protect with all known expedients every person whose occupation required him to labor in these subterranean rooms and roadways.

Wilmington Star Min. Co. v. Fulton, 205 U. S. 60, p. 71.

The act of 1899 is not unconstitutional on the ground that it compels a mine operator to employ a duly certificated mine manager or mine examiner. The requirement is not repugnant to the fourteenth amendment to the Federal Constitution. The subject is peculiarly within the police power of the State and the enactment of this requirement was an appropriate exercise of such power. The use and enjoyment of mining property is subject to the reasonable exercise of the police power of the State and the rights, privileges, and immunities of a mine owner as a citizen of the United States are not invaded by the requirement that he employ a certified mine manager or inspector, and the imposition of liability upon the owner for the violation of such regulations as these are but the appropriate exercise of the police power and are not wanting in due process.

Wilmington Star Min. Co. v. Fulton, 205 U. S. 60, p. 73;

Fulton v. Wilmington Star Min. Co., 133 Federal 193, p. 196.

The expense incurred by reason of the statute is imposed because of the peculiar dangers of the surrounding situation and subserves not only the interest of the miners but alike protects the mine owner and hence the payment

of the fee would be properly imposed upon the mine owner without violating any provision of the constitution.

Chicago-Wilmington etc. Coal Co. v. People, 181 Ill. 270;
Commonwealth v. Plymouth Coal Co., 232 Pa. St. 141, p. 148.

The liability imposed upon the mine operator to respond in damages for the willful failure of a mine manager or mine examiner to comply with the requirements of the statute is not in harmony with the principles of the common law applicable to the relation of master and servant, but a State may change and modify those principles in accord with its conception of public policy; and the court can not infer that the selection of mine owners as a class upon which to impose the liability in question was purely arbitrary and without reason.

Wilmington Star Min. Co. v. Fulton, 205 U. S. 60, p. 74;
Fulton v. Wilmington Star Min. Co., 133 Federal 193, p. 197.

The act of 1911 is not unconstitutional or invalid on the ground that the bill was not printed before its final passage by the House of Representatives as the Journal of the House contains evidence that the bill was printed before its final passage and that the act was legally passed.

Frey v. Kerens-Donnewald Coal Co., 271 Ill. 121, p. 125.

4. PURPOSE OF STATUTE.

The statute of 1899 was enacted for the purpose of providing for the health and safety of persons employed in a mine and to permit a person to enter a mine where there are dangers obvious and apparent is clearly contrary to the letter of the spirit although the mine examiner failed to report such dangerous conditions, otherwise a mine operator or owner would not be liable for an injury resulting from a dangerous condition in his mine, of which he had actual or personal knowledge, unless the mine examiner had previously reported to him that such dangerous condition did in fact exist.

Olson v. Kelly Coal Co., 143 Ill. App. 269, p. 272.

The scope and purpose of the act of 1899 is found in the enacting clause which is "to revise the laws in relation to coal mines and subjects relating thereto and provide for the health and safety of persons employed therein." By plain and expressed terms the statute is limited in its application to coal mines and persons employed therein.

Moore v. Dering Coal Co., 147 Ill. App. 95, p. 97.

The purpose of this statute was to throw additional safeguards about the lives, limbs, and health of miners, and in cases of conscious violations of the statute by operators, to relieve operative miners so far as it is possible to do so by legislative enactments from the consequences of their own folly or want of foresight.

Kellyville Coal Co. v. Strine. 117 Ill. App. 115, p. 123.
See Catlett v. Young, 143 Ill. 74.

The purpose of the law was to protect the lives and health of men engaged in a dangerous occupation and the many duties required to be performed by mine managers and mine examiners must be fully performed, whether the mine is large or small. But if they are so performed whether by one or two men, the spirit of the law is fully complied with.

People v. Kolb Coal Co., 151 Ill. App. 469, p. 472.

The purpose of the statute requiring the employment of an examiner having the proper certificate was to make the employment of a competent person as certain as it can be made by law.

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 290.

The object of the statute was safety to the employees and the question of whether or not it will make a job for an employee or cost the mine owner the price of a job is not to be considered in the interpretation of the statute.

Pate v. Gus Blair-Big Muddy Coal Co., 158 Ill. App. 278, p. 583.

The passage of the amendatory act of 1907, section 21, clause (b), is attributed to a desire on the part of the legislature to make the statute plain for the protection of drivers on hauling roads or gangways on which hauling is done by draft animals, but on which men are not required to pass to and from their work.

Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582, p. 585.

The act of 1911, considering all of its sections, was intended by the legislature as a general revision of the law applicable to coal mines and places relating thereto as manifested by the title of the act, and it was designed as a substitute for the act of 1899. Substantially all the subjects covered by the old act are found in the new, but in the new act the whole subject has been rewritten with no attempt to follow the arrangement of the matter in the former act. While differing in detail, both acts relate to the same general subject and are intended to accomplish the same general purposes.

Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 328, p. 332.

5. CONSTRUCTION AND AMENDMENT.

Where a statute is unambiguous and rights have accrued under it, the legislature may not afterwards place upon that statute a construction that will deprive a party of rights already vested. The passage of the amendatory act of 1907 can be attributed to a desire on the part of the legislature to make the statute plain for the protection of such men as drivers on hauling roads or gangways on which hauling is done by draft animals but on which men do not pass to and from their work.

Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582, p. 585.

6. MINE—MEANING—APPLICATION OF STATUTE.

The words "mine" and "coal mine" in section 34 are intended to signify any and all parts of the property of a mining plant on the surface or under the ground which contribute directly or indirectly under one management to the mining or handling of coal.

Spring Valley Coal Co. v. Greig, 129 Ill. App. 386, p. 391.

The general assembly did not intend this act to be effective only beneath the surface, but it meant by this act to legislate with reference to all parts of the mining plant which contribute directly or indirectly to the mining of coal and to the handling of it from the mine both below and above the ground.

Spring Valley Coal Co. v. Greig, 129 Ill. App. 386, p. 392.

The words "mine" and "coal mine" used in this section signify any and all parts of the property of a mining plant on the surface and underground which contribute directly and indirectly under one manager to the mining and handling of coal.

Moore v. Dering Coal Co., 242 Ill. 84, p. 87;

Moore v. Dering Coal Co., 147 Ill. App. 95, p. 97;

Pruett v. O'Gara Coal Co., 165 Ill. App. 470, p. 480;

Hakanson v. La Salle County Carbon Coal Co., 168 Ill. App. 147, p. 150.

See Spring Valley Coal Co. v. Greig, 226 Ill. 511.

The statute defines the word "mine" and "coal mine" to mean any and all parts of the property of a mining plant on the surface or under the ground

which contributes directly or indirectly under one management to the mining and hauling of coal. The provisions of this act require that coal, rock, and other material brought up by way of the shaft out of the earth shall be moved away from the shaft as they shall be brought up out of the rooms and entries of the mine.

Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 516.
See Moore v. Dering Coal Co., 147 Ill. App. 95, p. 98.

Many of the provisions of the statute relating to the examination and safeguarding of conditions on the top and appliances for the removal of coal when brought up out of a shaft must be regarded as much a part of the mine as the appliances for bringing it up. No distinction can be made between appliances used for removing coal to the place where it is dumped for shipment and those used for removing it to places where it is dumped for retail trade, as either is a part of the mining operations and come under the requirements to remove the coal to some place where it will not render unsafe or dangerous to employees any conditions at the top of the mine.

Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 517;
Hukanson v. La Salle County Carbon Coal Co., 265 Ill. 165, p. 166.

The machinery and appliances used in facilitating the work of removing coal and other material brought out of the mine and in complying with the requirements of the statute as to conditions in which the top shall be kept are embraced within the statutory definition of a coal mine.

Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 517;
Pate v. Gus Blair-Big Muddy Coal Co., 158 Ill. App. 578, p. 583.

Proof that a mining company owning coal lands caused two shafts some 200 feet apart to be sunk to and through the vein of coal to a depth of about 540 feet and thereafter employed underground a force of more than 20 miners, causing entries to be driven in every direction, constructing roadways and air courses, all such air courses and entries being of a length of more than 2,000 feet, laying tracks and switches, mining and taking out about 2,000 tons of coal, is sufficient to show a mine and to bring the plant and mine within the operation of the Illinois mines and miners' act and to render the operator liable for the death of a miner caused by falling material because of the failure of the operator to equip the cage, as required by the statute, with a proper and sufficient covering to protect miners riding thereon.

Hakanson v. La Salle County Carbon Coal Co., 265 Ill. 165, p. 166.
Hakanson v. La Salle County Carbon Coal Co., 168 Ill. App. 147, p. 150.
See Swengel v. La Salle County Carbon Coal Co., 182 Ill. App. 623, p. 630.

7. MINER—MEANING—APPLICATION OF STATUTE

The term "miner" in its ordinarily accepted meaning includes all classes of laborers who work in a mine, whether digging coal, timbering, or making places safe.

Driza v. Jones & Adams Coal Co., 171 Ill. App. 139, p. 145.

The Miners' Act must receive a liberal construction for the protection of those employed in mines; but aside from this the statute is broad enough to include an employee in the mine whose work contributed directly to the mining of coal in that his duties were to repair and keep in good running order the machines used for cutting down the coal.

Smith v. Consolidated Coal Co., 183 Ill. App. 572, p. 576.

The act of 1911 does not include in its terms the tippie at a coal mine and does not include a person not an operative coal miner and not exposed to any

dangers or perils peculiar to the mining business, and does not include persons who do not possess any disability, attributes, or qualification to mark him or persons of his trade as special subjects of legislation. A carpenter working on buildings owned by a coal company is not different in any respect from carpenters working on buildings or elevators not owned by coal companies and used for their purposes. The statute must be construed to include only operative coal miners and not to employees merely of a coal mining company who were not exposed to any dangers or perils peculiar to the mining business.

Rogers v. St. Louis-Carterville Coal Co., 254 Ill. 104, p. 110.

See Donaldson v. Spring Valley Coal Co., 175 Ill. App. 224, p. 229.

It is immaterial whether the evidence in an action by a miner for damages for injuries shows a willful failure on the part of the mine operator to comply with the statutory requirements, where the alleged injuries are not within the purport of the statute. Unless the injured employee is within the class contemplated by the statute and within the purport and protection for which the law was enacted he is without remedy in an action under the statute.

Lumaghi v. Voytalla, 101 Ill. App. 112;

Rosan v. Big Muddy Coal & Iron Co., 128 Ill. App. 128, p. 132;

Halberg v. Citizens Coal Mining Co., 149 Ill. App. 412, p. 415.

8. SHAFT—MEANING—DUTY TO MAINTAIN.

The term "shaft" used in section 34 is much more restricted in its signification than the term "mine" and the two are not synonymous. The term "coal shaft" might be used in an instrument in such manner as to evidently intend to be understood as meaning "coal mine" notwithstanding the actual difference in the distinction and the common understanding of the two terms.

Pruett v. O'Gara Coal Co., 165 Ill. App. 470, p. 480.

See Hakanson v. La Salle County Carbon Coal Co., 168 Ill. App. 147, p. 150;

Swengel v. La Salle County Carbon Coal Co., 182 Ill. App. 623, p. 630.

A place where miners in the employ of a mine owner are engaged in digging a hole in the ground, which, when completed, it was the purpose to equip and use as a "shaft" for one or more of the purposes specified in the statute, does not come within the definition of the word "shaft" in section 34 of the statute.

Cox v. Mt. Olive & Staunton Coal Co., 127 Ill. App. 24, p. 25;

Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60;

Moore v. Dering Coal. Co., 147 Ill. App. 95, p. 98.

The maintaining of an escapement shaft as required by the statute is for the express purpose of furnishing available means of egress to all persons employed in the mine. The egress for which a shaft is provided by this section to be maintained is confined to persons employed in the coal mine, and unless limited to this class of persons an obstruction of such a shaft would not be a violation of the statute. If the statute is enacted for the purpose of protecting a particular class of persons, then an indictment for its violation should be sufficiently definite to show that the persons referred to therein were within the class prescribed by the statute.

People v. Cannon, 186 Ill. App. 448, p. 450.

There is no specific penalty prescribed for obstructing an air shaft, and the penalty imposed is in general terms for violating any of the provisions of the act. Section 29 is not intended to apply to a mere temporary obstruction. A top boss of a coal mine can not be held criminally liable and punished therefor on the charge that he willfully caused the escapement shaft at a mine to be locked up and obstructed, where it is not charged that the mine was in opera-

tion or that the shaft was so constructed that there was not a place of egress to all persons employed in the mine.

People v. Cannon, 186 Ill. App. 448, p. 451.

It was not intended by section 3 to impose upon men who were working for wages at a coal mine the duty of maintaining an escapement shaft; but it devolves upon the operator, and if he fails to maintain it or remove any obstruction thereto, the punishment should be upon the operator and not upon some employee.

People v. Cannon, 186 Ill. App. 448, p. 452.

Under section 33 of this act, which authorizes parents to sue for the death of a son, killed because of the failure of a coal-mine operator to comply with the statute in failing to have flanges attached to the sides of the drum in connection with the engine used for hoisting men, as required by section 4, clause (c), there can be no recovery for the death of a miner where the evidence shows that the opening into which the miner fell and was killed was not used for the purpose of ventilation or escapement or for the hoisting and lowering of men and material in connection with the mining of coal.

Moore v. Dering Coal Co., 242 Ill. 84, p. 87.

See *Spring Valley Coal Co. v. Greig*, 226 Ill. 511.

Section 2, of the act of 1899, makes any shaft in process of sinking and in opening a project for the mining of coal subject to the inspection of the State Inspector of mines, and requires every hoisting shaft to be equipped with substantial cages protected and covered to prevent injury from falling objects. Other sections of the act require inspection and notice in working places where dangerous conditions exist and prohibit miners from entering a mine until the place is made safe. Under these provisions and the definitions of mine and shaft as given in the statute the question as to whether an uncompleted shaft in a coal mine that was being opened, and where some coal had been mined and removed, was a coal mine within the meaning of the statute, is a question of fact to be determined by a jury in an action for damages for the death of a miner killed while working in an uncompleted shaft.

Hakanson v. La Salle County Carbon Co., 265 Ill. 165, p. 167.

Hakanson v. La Salle County Carbon Coal Co., 168 Ill. App. 147, p. 151.

See *Moore v. Dering Coal Co.*, 147 Ill. App. 93, p. 97;

Moore v. Dering Coal Co., 242 Ill. 84.

The escapement shaft and place of exit used in section 3 mean one and the same thing and both mean the escapement shaft. The passageways required to be kept 5 feet high, 5 feet wide, and free from obstructions are those communicating with the escapement shaft from the main hauling ways. A passageway leading indirectly through other passageways to the escapement shaft or place of exit is not comprehended in the language of the statute. "The passageway leading from a main hauling way is not intended for use in hauling coal in going to and from their places of work by the miners." Its purpose is to afford a means of escape when exit from the mine can not be made by means of the usual method by way of the hoisting shaft. In time of accident or great excitement a large number of miners might have to use such passageway, and it is therefore necessary that it should be free from obstructions and wide enough and high enough to allow them to pass freely and rapidly.

Marquette Third Vein Coal Co. v. Allison, 132 Ill. App. 221, p. 226.

See *Spring Valley Coal Co. v. Rowatt*, 196 Ill. 156;

Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248;

Chicago-Coulterville Coal Co. v. Fidelity, etc., Co., 130 Fed. 957.

9. INSPECTION—EXTENT OF EXAMINATION—COMPLIANCE WITH STATUTE.

The statute does not provide how, nor to what extent, the required examination should be made; and if a mine operator employs a certified examiner and the mine is examined at the time required, this will constitute a compliance so far as the operator is concerned. The mere mistake of the examiner or a failure on his part to detect a defective place in the roof can not constitute a willful neglect of the operator within the meaning of the statute.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 121.

See New Virginia Coal Co. v. Gower, 119 Ill. App. 1, p. 5;

Kellyville Coal Co. v. Hill, 87 Ill. App. 424;

Joseph Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 393;

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 65;

Springfield Coal Min. Co. v. Gedutis, 127 Ill. App. 327, p. 329.

Section 18 of the amendatory act of 1907 requires mine examiners to inspect all places where men are instructed to pass or to work and to observe whether there are recent falls or obstructions in rooms or roadways or accumulations of gas or other unsafe conditions, and requires the mine examiner, when any such dangerous conditions are found to place a mark thereat as notice to all men to keep out. Duties of mine examiners with respect to inspection and knowing conditions are also found in the act of 1911.

Eaton v. Marion County Coal Co., 257 Ill. 567, p. 570.

The character of an examination of a mine which a mine manager is required to make is indicated by the qualifications which he is required to possess according to clause (f) of section 7. These concern his experience in mines generating dangerous gas, his practical and technical knowledge of the nature and properties of fire damp, the laws of ventilation, the structure and uses of safety lamps and the laws of the state relating to safeguards against fires in mines. But mine examiners are not required to know anything about engines, machinery or winding apparatus or to be competent to examine them. It would be unreasonable to suppose that the legislature, while requiring managers to pass an examination as to their qualifications for the duties imposed upon them, intended to impose upon them other duties requiring other special qualifications without requiring them to pass an examination as to the competency of such duties.

Pate v. Gus Blair Big Muddy Coal Co., 252 Ill. 198, p. 204.

Section 18 of this act, requiring a daily inspection of a mine to be made and a report of its condition to be kept in a book for that purpose is not limited in its obligation to the miners who are employed to dig and remove the coal from their various working places, but the statute is for the safety and protection of all who are employed in a mine, including engineers, firemen, pump men, shot frers, drivers and other workmen and employees.

Brennen v. Carterville Coal Co., 241 Ill. 610, p. 619;

Hougland v. Avery Coal & Min. Co., 246 Ill. 609, p. 615.

See Davis v. Illinois Collieries Co., 232 Ill. 284;

McCarthy v. Spring Valley Coal Co., 232 Ill. 473.

The inspection and examination required by this statute and imposed upon owners and operators of coal mines is not limited to the shafts and the rooms and entries and underground workings of the mine, but apply with equal force to all machinery and appliances used on the surface in removing coal and other material from the top of the shaft, and includes engines and cars used for hauling the coal to dumps at places of sale and shipment.

Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 518.

If a coal mine operator before permitting persons to enter the mine caused it to be examined by a duly certified examiner, who in good faith made an ex-

amination to ascertain if there were any dangerous conditions rendering it unsafe for men to work therein, and he reported the mine to be in a safe condition when in fact it was not, the mine operator cannot be held liable in damages to the widow of a miner killed by reason of existing dangerous conditions for the reason that the statute only authorizes an action to be maintained by the widow of the deceased where the statute was wilfully violated or its provisions wilfully not complied with, but it does not give a widow a right of action for mere negligence.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 121;

New Virginia Coal Co. v. Gower, 119 Ill. App. 1, p. 5.

See Himrod Coal Co. v. Schroath, 91 Ill. App. 234;

Joseph Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 393.

The fact that an ordinary employee who operated a rock-pump engine had been instructed by the top foreman to examine the machinery for the purpose of keeping it in order and that he visited the places for that purpose the day before an accident and injury and found it in perfect condition, is not a compliance with the statute requiring examinations to be made by a licensed mine examiner.

Spring Valley Coal Co. v. Greig, 226 Ill. 511, p. 519.

The term "boilers" used in this clause of section 4 includes all pipes and connections between the boilers and the steam chest or engine, and a failure to inspect these as required by the statute is a violation of the provision requiring the mine operator to have the machinery in his mine inspected daily by the mine examiner.

Sheppard v. Marquette Third Vein Coal Min. Co, 164 Ill. App. 495, p. 501.

The provisions of section 34 cover a stationary engine situated at the top of the mine, used to furnish power to haul coal cars to the retail dump and to bring back empty cars by means of cable. The duty of examination or inspection imposed by the statute is not limited to the shafts and portions of the mine which are underground but includes such stationary engine, machinery and other appliances used in removing coal and other material from around the top of the mine, and the failure of the mine examiner to inspect and mark any dangerous places is a violation of the statute.

Sheppard v. Marquette Third Vein Coal Min. Co., 164 Ill. App. 495, p. 502;

Spring Valley Coal Co. v. Greig, 226 Ill. 511;

Spring Valley Coal Co. v. Greig, 129 Ill. App. 326.

Section 18 deals with the examination of mines and concerns especially ventilation and safety of places where men are expected to pass from or to work; but tools, animals and machinery are not mentioned and do not come under any of the terms of the section, unless in the expression in clause (a) "or other unsafe conditions," or the expression in clause (b) "or any dangerous conditions" or "until all conditions have been made safe." The first two of these phrases refer expressly to working places, and the context shows that the last refers to nothing else.

Pate v. Blair-Big Muddy Coal Co., 252 Ill. 198, p. 203;

Eaton v. Marion County Coal Co., 257 Ill. 567, p. 571.

See Feichner v. Consolidated Coal Co., 176 Ill. App. 411, p. 413.

In an action for the death of a shot-firer caused by an explosion on the ground of an alleged violation of the statute in that the mine operator failed to properly ventilate the mine and permitted a dangerous accumulation of gas, powder, dust, and dangerous substances, it is proper to admit evidence of the conditions in the part of the mine where the explosion occurred, existing within such time as might tend to show its condition at that time; and it was

proper to prove another explosion in the same part of the mine two days before in corroboration of other evidence tending to show the presence of gas leaks or feeders or other explosive conditions.

Conover v. Harrisburg & Southern Coal Co., 161 Ill. App. 74, p. 78.

10. MINE OPERATORS—DUTIES GENERALLY—GOOD FAITH.

The question of the existence or non-existence of good faith on the part of the operator of a coal mine is not involved in a suit brought for a wilful violation of the statute.

Emerling v. Spring Valley Coal Co., 149 Ill. App. 97;

Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497, p. 504;

Catlett v. Young, 143 Ill. 74;

Odin Coal Co. v. Denman, 185 Ill. 413;

Eldorado Coal Co. v. Swan, 227 Ill. 586;

Davis v. Illinois Collieries Co., 232 Ill. 284;

Olson v. Kelly Coal Co., 236 Ill. 502;

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 406.

If a mine is in a dangerous condition or an owner or operator has failed with knowledge of its condition to comply with the statute, a liability exists, and he cannot excuse himself on the ground that he had the mine examined and in good faith thought it was not dangerous, as his liability does not rest upon the ground that in good faith or bad faith he thought there was no danger in the mine, but upon the ground that knowing the facts which made the mine dangerous, he failed to have the statutory marks properly placed in the mine.

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 412.

See Aetitus v. Spring Valley Coal Co., 246 Ill. 32.

Aside from the duty imposed by the statute on a mine operator the common law duty of a mine operator requires him to use reasonable care to provide a reasonably safe place for miners to work. The fact that an entry was in a dangerous condition and was known to be in such condition by the mine operator, and he failed to put the entry in a reasonably safe condition and failed to provide refuge places, is sufficient to justify finding him guilty of wilful violation of the statute.

Junction Min. Co. v. Ench, 111 Ill. App. 346, p. 351.

See Hinrod Coal Co. v. Clingan, 114 Ill. App. 568, p. 574.

11. DUTY OF MINE OPERATOR TO ADOPT AND POST RULES.

Section 32 of the act of 1899 makes it the duty of every mine owner and operator to promulgate and post rules for the conduct of his business and the government of his employees. The duty of the operator to establish and post rules and the duty of the miner to obey them are reciprocal. But notices posted stating that the business is dangerous and every employee must take constant care to avoid injury; that persons accepting employment do so with full notice that the danger of injury from falling roofs and coal is one of the usual risks of the service; that the manager does not assume that the place to which an employee is ordered is not dangerous, but every place in the mine is dangerous and the duty of ascertaining the danger and avoiding it is on the employee, and that no employee is authorized to incur any risks by relying on the timbermen; and the operator by employing timbermen does not agree to secure the roof of the mine. Such statements and notices are nothing more than an attempt to make laws under the guise of rules, and if claimed to operate as a contract against the negligence of the operator, they are void as against public policy. The mine owner and operator who fails to comply

with the statute in properly supporting the roof of an entry over a haulway is liable in damages to a trip driver injured by reason of the operator's failure to have the roof securely propped.

Consolidated Coal Co. v. Lundak, 196 Ill. 594, p. 597;

Consolidated Coal Co. v. Lundak, 97 Ill. App. 109, affirmed.

See Himrod Coal Co. v. Clark, 197 Ill. 514;

Gruenendahl v. Consolidated Coal Co., 108 Ill. App. 644, p. 649;

Spring Valley Coal Co. v. McCarthy, 136 Ill. App. 473, p. 476;

Kennedy v. Chicago & Carterville Coal Co., 180 Ill. App. 42, p. 46.

A rule adopted by a mine operator requiring miners to keep off of hauling ways and away from the bottom of the shaft during working hours while the mine was in operation is in conflict with the statute which provides that men who have completed their day's work or a miner who had been prevented from finishing work can come to the shaft to be hoisted, and a violation of such a rule can not be pleaded as a defense to an action by a miner for damages for injuries caused by being run down by a car while he was traveling through an entryway to the shaft after he had been prevented from completing his day's work.

Magnani v. Spring Valley Coal Co., 193 Ill. App. 107, p. 109.

The question of whether or not a posted rule of a mine operator prohibiting employees from traveling on a haulage road of a mine, had been abandoned and was no longer in force at the time of the injury complained of, where it was the habit of the miners and employees to walk to and from work through the haulage way and whether the company itself had abandoned the rule was a question of fact and was sustained by the evidence.

Marriage v. Electric Coal Co., 188 Ill. App. 142, p. 144.

12. DUTY OF OPERATOR TO EMPLOY MINE MANAGER OR EXAMINER.

The act of 1911 makes it the duty of all operators of coal mines to employ a mine examiner and specifically fixes the duties of such mine examiner.

Havron v. Shoal Creek Co., 184 Ill. App. 117, p. 119.

The statute requires the employment of a mine examiner in order that the operative miners may know, before they enter the mine, that it is safe. He is the agency designated by the legislature to see that the mine is safe for the operative miners. The law was not passed for the protection of the man who was required to make the examination, but for the protection of those whom the Constitution made it the duty of the legislature to protect by statute. The purpose of the employment of a mine examiner is that he shall go into the mine in advance of the miners and ascertain whether or not it is free from dangers from which it was the legislative duty to protect such miners.

Havron v. Shoal Creek Coal Co., 184 Ill. App. 117, p. 121.

Section 8 of the statute makes it unlawful for a mine operator to employ anybody not duly certificated to serve either as a mine manager, mine examiner, or hoisting engineer; and section 16 specifies the duties pertaining to the safety of the men employed in the mine that shall be performed by such certificated employees respectively.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 62.

It is unlawful for a mine operator to permit any person to serve as mine manager, mine examiner, or hoisting engineer who has not the proper certificate as to his qualifications for such service.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 63.

The purpose of the provision of the statute requiring coal mine owners and operators to employ managers and examiners who have obtained certificates from the State mining board was to guard against the possibility of the proprietor employing incompetent, intemperate, negligent or disreputable persons, and not to enable such owner and operator to shift to his employees his responsibility for the management of the mine.

Henrietta Coal Co. v. Martin, 221 Ill. 460, p. 467;
Davis v. Illinois Collieries Co., 232 Ill. 284, p. 290.

The requirement of section 8 of the statute is that the specified duty shall be performed by the persons named and that they shall not be performed by other than a person whose competency is evidenced by the required certificate. The statute relieves the mine operator of a part of his common-law duty in that it relieves him of the duty of making due inquiry as to the applicant's competency before employing him.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 63.

The statute does not restrain the mine operator in the exercise of any proper liberty in the selection of a mine manager, mine examiner, or hoisting engineer as at common law he had no right to select any but competent persons for such service; and the presumption must be that all competent persons desiring such employment will be properly certificated and all competent persons who are willing to perform such service may be employed, and a mine operator may at any time discharge any such employee for a failure to perform a specified duty, or for any other reason, or for no reason and employ another in his stead, or he may perform the duties himself in person, if he is competent to do so and procures the requisite certificate.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 63.

The fact that a mine operator, if he employs men to act in the capacity of mine managers and mine examiners, is required to employ such persons who have obtained a certificate from the State mining board is without significance. The purpose of the requirement was to guard against the possibility of the proprietor employing incompetent, intemperate, negligent, or disreputable persons and not to enable the operator to shift to his employees his responsibility for the management of the mine, but it is not obligatory upon the operator to select a particular individual or to retain one when selected if found to be incompetent.

Wilmington Star Min. Co. v. Fulton, 205 U. S. 60, p. 72.

A mine manager has power to instruct employees and miners as to their respective duties and to require of such employees and miners obedience to the mining law.

Morris v. O'Gara Coal Co., 181 Ill. App. 309, p. 316.

In the prosecution of a president of a mining corporation for willful and unlawful violation of the statute in that he employed a person to act and serve as mine examiner who did not have and hold a certificate of competency, it is error for the court to instruct the jury that they may disregard the charge of willfulness in determining the question of the defendant's guilt.

People v. Leiter, 143 Ill. App. 350, p. 356.

13. ASSISTANT MINE MANAGER—EMPLOYMENT.

Employment of an assistant mine manager in large mines is authorized by this statute and the failure of an assistant mine manager to deliver props to a miner on proper demand is a willful failure on the part of the operator himself

to perform the duties required by statute and renders him liable for any resulting damages.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 66.

Where a mine is so extensive that all the duties devolving upon the mine manager can not be discharged by one man, other persons may be designated as assistants to the mine manager who shall exercise these functions under the mine manager's instructions.

Morris v. O'Gara Coal Co., 181 Ill. App. 309, p. 316.

14. MINE MANAGERS AND EXAMINERS—DUTIES.

A mine examiner must perform the duties imposed upon him by the statute and he has no power to adjudicate the question of the safety of an entry or roadway at a particular place.

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 289;

Olson v. Kelly Coal Co., 236 Ill. 502, p. 506;

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 42;

Wilkerson v. Willis Coal & Min. Co., 158 Ill. App. 620, p. 626.

A person authorized to act as a mine manager under the statute can also act as mine examiner.

Brennen v. Carterville Coal Co., 241 Ill. 610, p. 619.

A person holding a manager's certificate may serve as a mine manager; and if a qualified mine manager acts also as a mine examiner and holds a certificate of competency as such and marks the dangerous places himself, the object of the law is fully met.

People v. Kolb Coal Co., 151 Ill. App. 469, p. 472.

Section 21 makes it the duty of the mine examiner to examine the workings of the mine within twelve hours preceding every working day in the mine; to carry a safety lamp properly equipped; to see that the air current is traveling properly; to measure the amount of air passing in the last cross cut or break-through; to inspect all places where men are required to pass or work; to observe whether there are any recent falls, dangerous roofs or accumulations of gas and to place conspicuous marks or signs in places where there are recent falls or dangerous roofs, and if there is an accumulation of gas, to place obstructions across the roadway, one of which must be outside the last open cross cut and it requires a daily record to be made and kept of the condition of the mine.

Havron v. Shoal Creek Coal Co., 184 Ill. App. 117, p. 121.

An indictment against a mine examiner for failure to properly mark a dangerous place in a mine is sufficient if it alleges that the mine examiner failed to mark the room or place as required; and it need not aver that he was "certificated"; but if the indictment avers that the mine examiner was "certificated," proof of such fact is not required, as the averment may be regarded as surplusage.

People v. Leiter, 186 Ill. App. 453, p. 457.

On account of the decisions of the Supreme Court construing the Mines and Miners' Act of 1899, the legislature enacted the amendatory statute of 1911 limiting the duty of the mine examiner to examinations of the underground workings of mines.

Rogers v. St. Louis-Carterville Coal Co., 254 Ill. 104, p. 108.

15. DELEGATION OF DUTIES—POWER TO EXEMPT FROM LIABILITY.

The object of the mining act is to protect, so far as legislative enactment may, the health of persons employed in the mines of the state while they are working in the mines. The principal measures prescribed for this purpose require the exercise of greater precaution and care on the part of the mine owner and operator for the safety of miners than was required by the common law. To say that the owner and operator may shift his liability to a person employed by him as an examiner or manager who holds a certificate of the State Mining Board is to lessen his responsibility and defeat in part the beneficent purposes of the statute. But to hold him liable for wilful violation of the act or a wilful failure to comply with its provisions on the part of his examiner or manager, is to give force and effect to the statute according to the intent of the law makers and to prolong the lives and promote the safety of the miners.

Henrietta Coal Co. v. Martin, 221 Ill. 460, p. 467.

A mine manager and mine examiner while in the performance of the duties prescribed by statute, are not fellow servants of a miner. The object of the statute is to require of the owner or operator of a mine the performance of those duties which the statute prescribes for the mine examiner and mine manager. The mine owner or operator as an individual, may himself act in either capacity if he possesses the necessary certificate otherwise he is required to perform such duties through the manager and through the examiner; and the employment of a mine examiner and mine manager duly certified, does not shift the responsibility from the mine operator and owner.

Henrietta Coal Co. v. Martin, 221 Ill. 460, p. 466.

The question whether the boss driver and vice principal, who at the time of an alleged injury, was acting as a motorman, was a fellow servant with the miner, or whether he sustained the relation of boss driver and vice principal is a question of fact to be determined by the jury, but when the boss driver assumes the duties of motorman and neglects to give proper warning or reasonable notice the failure of which would constitute negligence or a violation of the statute, his conduct becomes that of the mine operator and his negligence or failure to obey the statute in that regard is that of the mine operator.

McGuire v. North Breese Coal & Min. Co., 179 Ill. App. 592, p. 594.

16. VICE PRINCIPAL—MANAGER AND EXAMINER.

A mine inspector, mine manager, and night pit boss stand in relation to miner working in the mine as the master or vice principal.

Consolidated Coal Co. v. Wombacher, 134 Ill. 57;

Westville Coal Co. v. Schwartz, 75 Ill. App. 468, p. 474.

The mine examiner and mine manager duly certified and employed by a mine owner or operator stand for him and are vice-principals and perform those duties which the owner or operator cannot delegate to others in such manner as to relieve himself of responsibility; and for any wilful violation of the statute by either the mine examiner or manager or for any wilful failure by either of them to observe its provisions, the mine owner and operator is liable.

Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41;

Taylor Coal Co. v. Dawes, 220 Ill. 145;

Donk Bros. v. Stroff, 200 Ill. 483;

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 289;

Olson v. Kelly Coal Co., 236 Ill. 502, p. 505;

Wilmington & Springfield Coal Co. v. Sloan, 225 Ill. 467, p. 469;
 Mertens v. Southern Min. Co., 235 Ill. 540, p. 547;
 Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 392;
 Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 19.
 See Consolidated Coal Co. v. Fleischbein, 207 Ill. 533, p. 599;
 Consolidated Coal Co. v. Gruber, 188 Ill. 584, p. 588;
 Himrod Coal Co. v. Clingan, Ill. App. 568, p. 575.

An employee in a mine who is authorized to look after and care for the ventilation in his part of the mine and who was directed to fix a particular curtain for the purpose of controlling the ventilation is not a fellow servant of a miner injured because of the lack of proper ventilation, but is a vice principal of the mine operator with respect to the performance of the particular duties with which he was charged and for any negligence on his part the operator is liable.

Wilmington & Springfield Coal Co. v. Sloan, 225 Ill. App. 467, p. 648.

A person intrusted by a coal mine operator with the duty of caring for and repairing the ventilating apparatus and watching the air currents in the mine stands in the relation of vice principal to the mine operator and any notice to such person of the breaking down of any of the ventilating apparatus would be notice to the operator, and the operator would be liable for the wilful failure of such person or vice principal to perform the duties imposed upon him.

Wilmington & Springfield Coal Co. v. Sloan, 127 Ill. App. 218, p. 220.

See Sangamon Coal Min. Co. v. Wiggerhaus, 122 Ill. 279;

Odin Coal Co. v. Tadlock, 216 Ill. 624;

Taylor Coal Co. v. Dawes, 220 Ill. 145;

Rosan v. Big Muddy Coal & Iron Co., 128 Ill. App. 128, p. 131.

Under the act of 1899 a mine manager and mine examiner are vice principals of the owner and engaged in the performance of duties which the owner can not delegate to others in such manner as to relieve himself from responsibility.

Wilmington Star Min. Co. v. Fulton, 205 U. S. 60, p. 72.

Under the statute of 1890 the mine examiner and mine manager are held to be vice principals of the mine owner and operator. In Pennsylvania a similar statute was held unconstitutional and it was held by the Supreme Court of that State that the mining boss or foreman is a fellow servant of the other employees of the same employer and when a mine owner or operator employs a competent boss or foreman to direct the operations in a mine, he has discharged the full measure of his duty and is not liable for an injury arising from the negligence of a foreman. The Supreme Court of West Virginia under a similar statute has followed the Pennsylvania court.

Henrietta Coal Co. v. Martin, 221 Ill. 460, p. 466.

See Durkin v. Kingston Coal Co., 171 Pa. 193;

Williams v. Thacker Coke & Coal Co., 44 W. Va. 599.

17. COMPETENCY OF MINE EXAMINER—EFFECT OF CERTIFICATE.

The certificate given by the State to a mine manager, mine examiner or hoisting engineer, is prima facie evidence of the competency of the holder thereof; but it does not relieve the operator from responsibility for any part of his conduct not involving his competency and not even for that if the operator knew for any reason he was in fact incompetent.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 63.

See Consolidated Coal Co. v. Seniger, 179 Ill., 370, p. 374;

Fulton v. Wilmington Star Min. Co., 133 Federal 193.

The question as to whether or not a mine examiner was actually qualified to make the examination of a mine is immaterial so long as he had no certificate of competency. No matter how much knowledge of mining operations a per-

son may have, theoretically or practically or both, he can not be legally employed to make an examination until he has procured a certificate of competency.

People v. Leiter, 143 Ill. App. 350, p. 354.

18. MINE EXAMINER—RIGHT TO PROTECTION OF STATUTE.

Employment in a coal mine is a dangerous occupation and when a person accepts employment as a mine examiner he knows it is a dangerous position to fill as otherwise his employment would not be required. He must know all of the requirements of the statute as to the duties to be performed by him and when he accepts such employment he assumes all dangers incident thereto. He is not an operative miner, but he is the means selected by the legislature in the passage of the law for the protection of the operative miners. A mine examiner cannot recover in an action for damages against a mine operator for a failure to comply with the statutory requirements which are only applicable to operative miners, and a mine examiner does not come within the class entitled to protection under the provisions of the statutes.

Havron v. Shoal Creek Coal Co., 184 Ill. App. 117, p. 122.

19. LIABILITY AND NONLIABILITY OF OPERATOR—INSTANCES.

This statute is to be liberally construed but every accident occurring in a mine is not to be attributed necessarily to the wilful failure of a mine operator to comply with some provision of the act. A mine operator is not liable as for a wilful violation of the statute in failing to keep a commodious passageway at the bottom of the shaft where the injury complained of was caused by a mule, which on being struck by the driver, rushed forward and fell upon and injured the complaining miner, as in such case the failure to provide a commodious passageway around the landing had nothing to do with the injury complained of.

Carter v. Sangamon Coal Co., 162 Ill. App. 8, p. 10.

There can be no recovery in an action against a mine operator for a wilful violation of the statute for the death of an employee caused by a pipe falling while the employee was riding down a shaft in an open platform, where the mine operator had driven two shafts over 500 feet to the bottom of the third vein and had connected these at the bottom by a way intended as an air passage and where the mine owner cut through the vein of coal and took out the coal and cut a main entry from one shaft to the other, keeping the coal and earth and rock separate, but not raising the coal as a part of the operation of a coal mine, but in the work of preparing the plant to be operated as a coal mine, for the reason that the plant was not being operated as a coal mine but only work preparatory to such operation.

Hakanson v. La Salle County Carbon Coal Co., 168 Ill. App. 147, p. 150;

Swengel v. La Salle County Carbon Coal Co., 182 Ill. App. 623, p. 630.

See Moore v. Dering Coal Co., 242 Ill. 84;

Moore v. Dering Coal Co., 147 Ill. App. 95.

It is the duty of a mine operator to see that the shooting is so directed that a pillar of coal between rooms is left of sufficient thickness to be safe. A miner is not required by any rule or regulation or by any statute to keep himself advised of the exact location of the cut on the opposite side of a pillar and to make measurements to ascertain the thickness of the pillar. These all pertain to the duties of the mine manager and the mine examiner as representatives of the mine operator; and a mine operator is liable for injuries to a miner

caused by a shot blowing through from an adjoining room, as a result of the failure of the mine examiner and mine manager to discover and mark or otherwise report that the place was dangerous by reason of the thinness of the pillar.

Franci v. Tazewell Coal Co., 157 Ill. App. 457, p. 482.

A distinction is made between cases where a mine owner or operator has failed to do some specific thing required by the statute, and where the alleged dangerous condition relates to a matter not specifically prescribed by the statute. Where the statute has directed a fence to be built around the top of a shaft, or a light to be displayed, or roadways to be sprinkled, the operator can not say that he did a thing which he thought was a sufficient protection to the miners. The statute contains no directions as to how drop doors shall be built, or how a roadway shall be fitted for travel, except that the operator must guard against dangerous conditions. In such case, if the mine examiner made an examination as required by statute and in good faith decided that the conditions are safe and so reported, and the mine manager so believed, and if the conditions are those which prudent mine managers consider safe in their minds, then the mine operator can not be held liable for wilfully permitting dangerous conditions to exist.

Hamilton v. Spring Valley Coal Co., 149 Ill. App. 10, p. 19.

See *Bisel v. Kerens-Donnewald Coal Co.*, 153 Ill. App. 8.

The requirements of this statute seek to protect the miner by compelling the mine owner to provide material "so that the workmen may at all times be able to properly secure said workings for their own safety." If the miners only used the timber, propped the roof for themselves and thus undertook to secure themselves against injury, then they would assume this risk. But where a driver in a coal mine had nothing to do with the roof, found it out of repair, of which the mine operator had notice through his vice principal and assumed to repair it, under such circumstances the statute requiring the operator to furnish timbers does not protect him against liability for injury to a driver where the operator had notice of the dangerous condition of the roof, and where it was no part of the duties of the driver, and where he had neither time nor opportunity to repair the roof.

Consolidated Coal Co. v. Bokamp, 181 Ill. 9, p. 20.

20. DUTY OF OPERATOR—MINER MAY ASSUME PERFORMANCE.

The miner has a right to rely upon the performance of the mine examiner's duty and the absence of a mark indicates that in the judgment of the mine examiner the roof is not dangerous.

Arkley v. Niblack, 272 Ill. 356, p. 362.

21. HOISTING ENGINEERS—DUTY TO EMPLOY—RIGHT TO DISCHARGE.

The law requires a mine operator to select his engineer from a certain class, but it does not make it obligatory upon an operator to employ a particular certified engineer or to retain him in his employment, and it is not a violation of the law for a mine operator to discharge a certified engineer if he is found to be incompetent.

Consolidated Coal Co. v. Seniger, 179 Ill. 370, p. 374.

See *Staunton Coal Co. v. Bubb*, 119 Ill. App. 278, p. 291.

Section 7 of the statute makes it obligatory upon the owner, agent or operator of a coal mine not to place in charge of any engine whereby men are lowered or hoisted into or out of a mine, any but experienced, competent and sober per-

sons over the age of 18 years. Section 14 confers a right of action upon any person injured by reason of a wilful violation of any of the provisions of the act. Under this statute a coal mine operator employing an incompetent person and retaining him in his service after his incompetency is known, is liable in an action for damages by a miner injured by reason of the incompetency of such engineer.

Niantic Coal Min. Co. v. Leonard, 126 Ill. 216, p. 217.

Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95, p. 97.

The certificate required by this statute does not conclusively establish the competency of the person to whom it is issued, but this may be considered with other evidence upon the question of his competency. The State Board of Mine Examiners has no power to adjudicate upon the question of the competency of a certified engineer so as to bind a mine operator or his employees, and an injured miner is not debarred from proving that a certified engineer was, in fact, incompetent and unfit for the performance of his duty and that the mine operator had notice of such incompetency and unfitness.

Consolidated Coal Co. v. Seniger, 179 Ill., 370, p. 374.

See *Staunton Coal Co. v. Bubb*, 119 Ill. App., 278, p. 281.

22. HOISTING MACHINERY—DUTY—CARE REQUIRED—LIABILITY.

Section 28 was enacted for the protection of men when the hoisting or lowering of men occurs, and the part reading "or when the landing at which men take or leave the cage is obscured by steam or otherwise" relates back to the "hoisting or lowering of men." The object of requiring a light at the shaft was to protect men whose duties require them to go up and down the shaft so they might be able to see the shaft and cages and avoid danger, and it is immaterial whether one man or many are so engaged.

Grimm v. Donk Bros. Coal & Coke Co., 161 Ill. App. 101, p. 104.

The failure of a mine operator to equip a cage with safety catches, as required by the statute to prevent its falling in case the machinery or appliances break or fail to work properly is a wilful violation of the statute for which a mine operator is liable where an injury results therefrom, and the fact that the injured miner himself violated the statute is not a defense to an action by him for damages, and especially where his violation had nothing whatever to do with contributing to the injury.

Darling v. Wood, 168 Ill. App. 272, p. 275.

See *Merlo v. Johnston City & Big Muddy Coal etc. Co.*, 173 Ill. App. 425, p. 430.

Sections 23 and 28 of this act are enlargements of section 6 of the act of 1887. But the words "of coal" found in section 6 of the act of 1877 have been omitted from this act and the words "at night" have been changed to read "for the day." Section 28 of this statute is ambiguous, but it should be read as section 6 of the act of 1877 did originally, and the lawmakers either changed it unintentionally or regarded it as though apparent that the words "after hoisting ceases for the day" referred back to the last antecedent "coal" and it was not necessary to repeat it. Section 28 means what section 6 (act of 1877) originally said, that the bottom man and top man should remain at their posts at least 30 minutes after the "hoisting of coal" ceases for the day.

Thompson v. O'Gara Coal Co., 161 Ill. App. 39, p. 41.

See *Brunnworth v. Kerens-Donnewald Coal Co.*, 169 Ill. App. 58.

The provision of section 28 requiring a cager to remain at the bottom of the shaft for at least half an hour after hoisting ceases for the day is not for

the benefit of the day shift alone, but applies to members of the night shift who enter and work the mines in the nighttime.

• *Brunnworth v. Kerens-Donnewald Coal Co.*, 280 Ill. 202, p. 218.

See *Bartlett Coal & Min. Co. v. Roach*, 68 Ill. 174;

Brunnworth v. Kerens-Donnewald Coal Co., 169 Ill. App. 58.

The statute requires a brake on every drum so as to prevent accidents in case any of the machinery should break or give out; but it does not compel the furnishing of such a compliance as might prevent an accident in case the machinery should for any reason fail. The object in requiring a brake on the drum was as a protection for the life of the miner, in the cage ascending or descending, when at any time or for any cause the machinery used in raising or lowering the cage should refuse to perform any of its proper functions. The purpose of the brake is to stop the cage whenever there may be danger, whether danger arises from the giving out or breaking of machinery or for other causes.

Beard v. Skeldon, 113 Ill. 584, p. 587;

Illinois Third Vein Coal Co. v. Cioni, 215 Ill. 583, p. 588;

Beard v. Skeldon, 13 Ill. App. 54;

See *Spring Valley Coal Co. v. Patting*, 86 Fed. 433.

A miner in an action for damages by him for injuries received while being lowered in a cage, in order to recover against the owner and operator for a wilful violation of the statute in lowering the cage into the mine at a prohibited rate of speed, must prove that the operator, by his engineer, consciously and knowingly lowered the cage, at the time the miner was descending, at a rate of speed in excess of the rate of 600 feet per minute.

Taylor Coal Co. v. Dawes, 220 Ill. 145, p. 148.

In an action for damages for the death of a miner on the ground of an alleged violation of a mine operator to permit employees to be raised and lowered in man at the bottom of the shaft charged with the duty of attending signals and enforcing the rules governing the carriage of men on cages, it is a wilful violation of a mine operator to permit employees to be raised and lowered in a cage without a competent person stationed at the bottom of the shaft; but there can be no recovery in such an action where it appears that the presence of a competent person could not have avoided the accident and where the absence of such bottom man was not the proximate cause of the death.

Hickey v. Springfield Coal Min. Co., 149 Ill. App. 453, p. 456.

A miner who is lowered and raised in and out of a mine in a cage used for that purpose is not a fellow servant with the engineer who operates the hoisting engine, where the duties of the two men never bring them together in their respective duties and where their duties are as disconnected as if they were employed by different masters and performed their labors in places having no connection whatever with each other and where their duties did not in any manner require them to act or cooperate with each other.

Spring Valley Coal Co. v. Patting, 210 Ill. 342, p. 352.

See *Illinois Steel Co. v. Olste*, 116 Ill. App. 303;

Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 394.

A miner injured in a coal mine about two o'clock in the morning cannot recover for such injuries on the ground of a wilful violation of the statute in that the mine operator failed to have a bottom man at the shaft where it appeared that the hoisting of coal had ceased several hours before and as early as 4:30 on the day previous.

Thompson v. O'Gara Coal Co., 161 Ill. App. 89, p. 42.

See *Brunnworth v. Kerens-Donnewald Coal Co.*, 169 Ill. App. 58.

23. SIGNALS—ADDITIONS BY OPERATOR.

Sections 23 and 28 were parts of the revision of the mining statute passed at the same time relative to the same subject-matter and are to be read together as though parts of the same enactment.

Thompson v. O'Gara Coal Co., 161 Ill. App. 39, p. 41.

Under section 23, a mine operator may with the consent of the inspector add to the code of signals in its discretion for the purpose of increasing his efficiency or promoting the safety of the men in the mine; but such code must be conspicuously posted.

Thompson v. O'Mara Coal Co., 161 Ill. App. 39, p. 40.

24. FENCING SHAFT AND LANDINGS—GATES AND CAGES.

Section 2 of the act requires a mine operator to fence the upper and lower landings of the shaft with automatic or other gates so as to prevent men or materials from falling into the shaft. By this the legislature intended that the lower landing at the top of every mine shaft shall be securely fenced with automatic gates, or some other kind of gates not automatic, and that such gates when so used, whether automatic or nonautomatic, would fulfill the requirements of the statute if they were reasonably adapted for the purpose for which they were required and were sufficient to prevent either men or materials from falling into the shaft.

Donk Bros. Coal & Coke. v. Sapp, 133 Ill. App. 92, p. 96.

See Springfield Coal Min. Co. v. Gordon, 147 Fed. 690.

A mine operator is guilty of wilful violation of the act where he removed the gates enclosing the top of the shaft and permitted a broken speaking tube to remain in such condition and position that an employee using the tube was compelled to go inside of where the gates were and should have been maintained and get down on his knees in order to use the speaking tube and while in that position was killed by a descending cage.

Willis Coal & Min. Co. v. Grizzell, 100 Ill. App. 480, p. 482.

25. LIGHTING SHAFT—DUTY AND LIABILITY—QUESTION OF FACT.

Section 28 requiring a good and sufficient light to be maintained at the bottom of a shaft so that persons may clearly discern the cage and objects in the vicinity, applies to the safety of the men or miners while entering or leaving the mine; but it has no application to and is not intended for the benefit of persons working in the mine or traveling along the entries.

Lumaghi v. Voytilla, 101 Ill. App. 112, p. 113.

Whenever the hoisting or lowering of men occurs before daylight or after dark, or when the landing is otherwise obscure, there must always be maintained at such landing a light sufficient to show the landing and surrounding objects distinctly.

Lumaghi v. Voytilla, 101 Ill. App. 112, p. 114.

The failure of a coal mine operator to maintain a light at the bottom of a shaft sufficient to show distinctly the landing and the surrounding objects in the mine so as to enable miners safely to get into the cage, may be the proximate cause resulting in the death of a miner attempting to board the cage where the light was insufficient; but whether or not such failure is the prox-

mate cause of an injury is a question of fact to be determined under the particular circumstances of each case.

Brunnworth v. Kerens Coal Co., 269 Ill. 202, p. 204;
Brunnworth v. Kerens Coal Co., 169 Ill. App. 62;
Kellyville Coal Co. v. Strine, 217 Ill. 516;
Spring Valley Coal Co. v. Patting, 210 Ill. 342, p. 353;
Spring Valley Coal Co. v. Patting, 112 Ill. App. 4, affirmed.

In an action by a miner for injuries occasioned on leaving the cage at the bottom of the shaft on the alleged ground that the place was insufficiently lighted, it is proper to prove that the mine owner and operator had failed to properly light the bottom of the shaft on former occasions, as bearing upon the question whether the owner and operator had wilfully violated the statute.

Robertson v. Donk Bros. Coal & Coke Co., 238 Ill. 344, p. 347.

Under this statute requiring a coal mine operator to maintain a sufficient light at the top and bottom of the shaft to show the landing and surrounding objects distinctly and whether a light is maintained that is a sufficient light at the bottom of the shaft so that persons coming to the bottom could clearly discern the cage and objects in its vicinity is a question of fact which is properly submitted to a jury in an action for damages for injuries alleged to have resulted from a failure to maintain a light.

Eldorado Coal Co. v. Swan, 227 Ill. 586, p. 589.

See *Aetitus v. Spring Valley Coal Co.*, 246 Ill. 32, p. 40;

Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497, p. 503.

A miner or employee of a mine operator who was required to take a box of tools to the shaft and to the cage to be lowered, but who was not to be lowered at the time he so took the box of tools but was to follow down after the box, was at the time he took the box of tools to the shaft or cage to be lowered within the protection of the statute, and the failure of the mine owner to have the place lighted as required is a wilful violation of the statute and renders him liable for the death of such miner caused by falling into and down the shaft.

Grimm v. Donk Bros. Coal & Coke Co., 161 Ill. App. 101, p. 104.

26. LIGHTING SHAFT—LANDINGS—MEANING.

Within the scope, the purpose and fair meaning of the statute, the bottom of a shaft where the cage stops to let men off who are being lowered into the mine for the purpose of going to their respective places of work is a "landing." The statute requires that sufficient lights be maintained at the top and bottom landings when men are being hoisted and lowered. The statute was intended to protect persons coming to the bottom for the purpose of going to their different working places in the mine, as much as to protect persons coming from their working places to the bottom of the shaft for the purpose of leaving the mine.

Robertson v. Donk Bros. Coal & Coke Co., 143 Ill. App. 391, p. 394.

The object of the statute is to require a mine owner or operator to keep the top and bottom of the shaft by which the miners enter the mine sufficiently lighted so they can safely enter and leave the cage. The word "landing" in paragraph (b) is broad enough to cover the place at the bottom of the shaft or at the top of the shaft where the miners enter or leave the cage and it requires the mine owner or operator to keep each of such places lighted. A miner injured on leaving a cage at the bottom of the shaft is injured at a landing within the meaning of the statute, and it can make no difference whether he was approaching the bottom of the shaft from above or from his

working place below, as in either case he was coming to the bottom of the shaft; and if he approached the bottom of the shaft from above, he did so with a view to leave the cage, and if he approached it from below he did so with a view to entering the cage and in either event he was entitled to have the bottom of the shaft lighted so that he could leave or enter the cage in safety.

Robertson v. Donk Bros. Coal & Coke Co., 238 Ill. 344, p. 347.

27. HAULAGEWAYS—DUTY AND LIABILITY OF OPERATOR.

The failure of a mine operator to keep one side of the haulage road clear of refuse or material is a violation of this section and renders the operator liable where such failure was the proximate cause of an injury to a driver.

Petton v. Consolidated Coal Co., etc., 183 Ill. App. 567, p. 571.

A driver injured by reason of his mule stopping suddenly, the car running onto the mule throwing the driver upon the track and running upon and over him, is entitled to recover damages on the ground of an alleged violation of the statute where the operator permitted refuse and materials to accumulate along the side of the track where there was less than 2½ feet from the rail to the rib, and by reason of which the driver was unable to get out of the way of the car; and under such circumstances the accumulation of the material, a violation of the statute, was the proximate cause of the injury.

Petton v. Consolidated Coal Co. etc., 183 Ill. App. 567, p. 571.

A mine owner and operator who fails to comply with the statute in properly supporting the roof of an entry over a haulway is liable in damages to a trip driver injured by reason of the operator's failure to have the roof securely propped.

Consolidated Coal Co. v. Lundak, 196 Ill. 594, p. 597;

Consolidated Coal Co. v. Lundak, 97 Ill. App. 109, affirmed.

28. REFUGE PLACES—MEANING OF REQUIREMENT—DUTY AND LIABILITY.

The failure of a mine operator to make places of refuge along the sides of a haulage way as required by the statute is a willful violation of the statute.

Brookside Coal Min. Co. v. Dolph, 101 Ill. App. 169, p. 183;

Brookside Coal Min. Co. v. Hajnal, 101 Ill. App. 175, p. 176;

Muren Coal & Ice Co. v. Howell, 107 Ill. App. 1, p. 10.

Places of refuge are required by the statute in a hauling road on which the hauling is done by draft animals although men do not pass to and from their work through such hauling way. To limit the requirements of the statute so as to require the refuge places in hauling ways where hauling is done by draft animals where men pass to and from their work, would require the change of the word "or" in the statute to the word "and." The statute means that places of refuge shall be made in hauling roads or gangways on which hauling is done by draft animals, and that places of refuge shall be made in gangways where all men have to pass to and from their work.

Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582, p. 584.

Prior to the time of the amendment of 1907 section 21, clause (b), of the act of 1899 was construed to mean that a mine operator must construct and cut in the side walls refuge places in all hauling roads or gangways on which hauling is done by draft animals and such refuge places must be cut in side walls of all gangways wherein men pass to and from their work.

Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582, p. 584.

The amendatory act of 1907 was not intended to be a legislative construction of the act of 1899 and to construe that act so as not to require places of refuge on a hauling road or gangway on which hauling is done by draft animals, and whereon men do not pass to and from their working places, but whereon drivers are obliged to be in the performance of their duties.

Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582, p. 585.

Where hauling is done by draft animals upon a roadway of sufficient length to permit places of refuge to be cut in the side wall, the statute imposes the duty upon the operator to provide such places of refuge, and this notwithstanding men may not be required to pass thereon to and from their work, as the statute in this regard is in the disjunctive and not the conjunctive. The legislature appreciated the fact that draft animals do not work automatically and independently of human agency and that in all hauling roads and gangways and where draft animals are used men are also necessarily required to pass and re-pass in performing the several duties of driving, inspection, timbering and removing falls.

Schlapp v. McLean County Coal Co., 138 Ill. App. 1, p. 4.

The statute does not require a mine operator to maintain a clear space of 2½ feet between the car and the rib the entire length of a roadway. If there is such a clear space the entire length of the roadway, or if rooms are driven therefrom at regular intervals not exceeding 20 yards, then no places of refuge are required. Places of refuge are only required where both of the other statutory avenues for the safe passage of men are absent.

Schlapp v. McLean County Coal Co., 138 Ill. App. 1, p. 4.

Where it is shown that there was sufficient space in a hauling road between the cars and the rib so as not to require the cutting of refuge places as provided by the statute, or if refuge places were cut, it is a violation of the statute if the space between the cars and the rib is not kept clear of obstructions, and where it is shown that much dirt or other material was piled up in such space so that a miner or driver seeking refuge from an approaching car would be obliged to climb up and crawl into a little shelf toward the upper part of the 5 feet of room between the floor and the roof.

Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582, p. 586.

A compliance with the statute on the part of a mine operator as to places of refuge does not relieve him from his common-law duties with reference to safety in entries. The purpose of the statute was not to abrogate the common law as to such duties but to impose an additional duty.

Muren Coal & Ice Co. v. Howell, 107 Ill. App. 1, p. 10.

Under section 21 of the statute a mine operator may construct refuge holes in such places as he sees fit, provided the places are not more than 20 yards apart. He is not required to construct a refuge hole at any particular point.

Schlapp v. McLean Co. Coal Co., 235 Ill. 630, p. 634.

The duty of providing places of refuge is required of coal operators on all inclined planes where coal cars are hauled, whether by machinery or mules or on single or double tracks. A failure to do so will render a coal-mine operator liable for injuries to a miner caused when two trains at the same time broke loose from the cable at the top and came rushing down the incline abreast, and where there were no refuge places provided.

Brookside Coal Min. Co. v. Dolph, 101 Ill. App. 169, p. 173;

Brookside Coal Min. Co. v. Hajnal, 101 Ill. App. 175, p. 176;

Muren Coal & Ice Co. v. Howell, 107 Ill. App. 1, p. 10;

Himrod Coal Co. v. Clingan, 114 Ill. App. 568, p. 575.

The statute requires places of refuge in mines where the hauling is done by machinery on single track hauling roads upon which the employees or miners must travel on foot to and from their work. The statute does not make it a requirement that there shall be places of refuge in every hauling way. In an action by a miner for injuries sustained in a hauling way on the ground of the alleged violation of the statute on the part of the mine operator in failing to provide refuge places, the mine owner may show that a manway had been provided for a long distance parallel with the main hauling way for the employees and miners to use in going to and from their work and that the injured miner was forbidden to travel upon the hauling way, and that there were conspicuous notices throughout the mine forbidding men to travel on the hauling or tripways and required them to take the manway.

Guthrie v. Empire Coal Co., 142 Ill. App. 332, p. 334;

Guthrie v. Empire Coal Co., 150 Ill. App. 530.

Where a mine operator furnishes a reasonably safe and sufficient manway parallel with the hauling way and orders and directs or warns all men working in the mine to walk to and from their work in the manway and not to walk upon the hauling way, then the mine operator is not required, under the statute, to build places of refuge in the hauling way.

Guthrie v. Empire Coal Co., 142 Ill. App. 332, p. 335;

Guthrie v. Empire Coal Co., 150 Ill. App. 530.

It is not a violation of any provision of section 21 to lay the haulage track near the rib even if places of refuge are required on that side of the haulage way. Nor is it a violation of the section if there is a clear space on the other side of the track, which was the working place of the men, as wide as the statute declares sufficient. There is no reason for saying that the statute requires two passageways 2½ feet wide, one on each side of the track. A mine owner or operator has the option to leave a clear space or to make places of refuge. The mere proof that the track was laid 6 inches from the rib on one side of the haulage way does not establish a liability under the statute.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 49.

The failure of a mine operator to construct refuge holes as required by the statute, or to construct a refuge hole at a particular place, cannot render the mine operator liable for an injury to a driver which occurred while he was attempting to sprag the wheels of his car where the injury occurred without reference to the presence of the refuge hole.

Schlapp v. McLean Co. Coal Co., 235 Ill. 630, p. 634.

20. LIGHTS ON MOTORS AND CARS.

Under section 21 a coal-mine operator is bound to maintain a light on the front car of the train or trip in taking the cars in and out of his mine.

Guthrie v. Empire Coal Co., 142 Ill. App. 332, p. 336;

Guthrie v. Empire Coal Co., 150 Ill. App. 530;

Banzules v. O'Gara Coal Co., 186 Ill. App. 583, p. 586.

The provisions requiring lights to be carried on a trip or train of pit cars is separate and distinct from the first paragraph, which requires places of refuge on single-track haulage roads where carrying is done by machinery, and is separated therefrom by a complete sentence referring to an entirely different matter—that of signalling on rope haulage roads. It is not necessary that the motor should be attached to the trip of cars to require a light to be carried thereon in case it or other machinery has furnished or is furnishing the motive

power. It is just as important for the protection of coal miners that a trip of cars which had been placed in motion by a motor and shunted down another track should carry a light to warn the miners of its approach as that the motor itself should carry a light.

Baziules v. O'Gara Coal Co., 186 Ill. App. 583, p. 586.

It is immaterial whether the provisions of section 15 with reference to lights on the front and rear of a trip of cars applies during the time the trip is being made up, where the evidence fails to show that the absence of the light was the cause of the injury.

McGuire v. North Breese Coal & Min. Co., 179 Ill. App. 592, p. 598.

30. PROP—DUTY OF OPERATOR TO FURNISH—LIABILITY FOR FAILURE.

The statute requires the owner or operator of every coal mine to keep a supply of timber constantly on hand of sufficient length and dimensions to be used as props and cap pieces and to deliver the same as required, with the miners' empty cars so that the workmen may at all times be able to properly secure their workings for their own safety, and this statute supersedes any other obligation on the part of the mine owner to look after the roof and to provide a reasonably safe place for the workmen.

Consolidated Coal Co. v. Bokamp, 181 Ill. 9, p. 20.

See Consolidated Coal Co. v. Schleber, 167 Ill. 539;

Carterville Coal Co. v. Abbott, 181 Ill. 495;

Kellyville Coal Co. v. Yehnka, 94 Ill. App. 74, p. 81.

The statute should have a reasonable and liberal construction and one which shall accomplish its purpose; and the miner must be the one to determine the length and dimensions of the props and cap pieces which he deems necessary to properly secure the roof for his own safety, and if he orders six and one-half foot props the owner or operator has not complied with the statute when he has furnished props which must be spliced or sawed in two before they can be used.

Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333, p. 333;

Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 95, affirmed;

Kellyville Coal Co. v. Strine, 217 Ill. 516 p. 534;

Springfield Mining Co. v. Gedutis, 227 Ill. 9, p. 11;

Hackart v. Decatur Coal Co., 243 Ill. 49, p. 51.

See Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271.

The statute requires a mine owner and operator to furnish proper and suitable timbers and to deliver the same so that the workmen may at all times be able to properly secure their workings for their own safety. The fact that the miner's union fixed the price per yard for opening entries and the further fact that the mine operator and a miner engaged in driving an entry fixed the price for the services in excess of the scale of the miners' union, or fixed a price to be paid in addition to the price fixed by the scale of the union, can not have the effect to remove the miner from the class denominated "workmen" in the statute.

Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 538, p. 541.

The statute requires a mine owner and operator to keep suitable props and timbers on hand and deliver them to the miner, but it does not specify any particular place that the props or timbers are to be delivered. It was the custom for the mine owner and operator to deliver props at the bottom of a shaft and witnesses testified that when there were props on hand they were kept at the bottom of the shaft where the cages stopped when they came down into

the mine and that there were no props at the bottom of the shaft at the time of the particular injury to the miner for which he sued.

Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 538, p. 541;
Kellyville Coal Co. v. Yehuka, 94 Ill. App. 74, p. 81.

In a large mine employing a large number of miners and drivers it is a reasonable and common sense method and one that will promote the best interests of operator and miners for the manager to instruct the miners to make their requests for props direct to the drivers; and under such a rule and custom a demand for props made by a miner upon a driver is a sufficient demand under the statute.

Donk Bros. Coal & Coke Co. v. Lucas, 226 Ill. 23, p. 25.

The statute requires the mine operator to provide a sufficient supply of props delivered on the miner's car at the usual place when demanded and miners are not required to hunt in cross-cuts or other parts of the mine where they are not at work for props, nor to take notice of the fact that there are props in such places for use. It is a question of fact in an action for damages for injuries caused by the alleged failure of a mine operator to furnish props for a jury to determine whether or not the props were furnished.

Elam. v. Majestic Coal Co., 155 Ill. App. 375, p. 380.
Brazil Block Coal Co. v. Hotel, 192 Fed. 108.

The fact that a miner has unused props in his room will not relieve the mine operator of the duty to furnish props of suitable length on demand. The fact that a miner orders props before they are needed will not relieve the mine operator from liability for failure to furnish.

Russell v. O'Gara Coal Co., 188 Ill. App. 328, p. 329.

The miner himself has the right to demand from the mine operator such timbers as he thinks necessary to make his room a safe place in which to work, and he is not bound by the judgment of the mine manager upon this subject. The statute expressly says that the mine manager shall always provide a sufficient supply of props, caps and timbers delivered on the miners' cars at the usual place when demanded. This language means that the mine operator is to furnish the timbers upon the demand of some one else, and this some one else must be the miner, as the section further provides that the materials furnished should be in suitable lengths and dimensions for the securing of the roof by the miner.

Springfield Coal Min. Co. v. Gedutis, 127 Ill. App. 327, p. 328.

When a miner makes a demand upon the mine manager for props and timbers which are not furnished in compliance with such demand and an injury results from such failure upon the part of the mine operator to furnish the props and timbers, then the mine operator is liable under the statute for wilful negligence.

Springfield Coal Min. Co. v. Gedutis, 127 Ill. App. 327, p. 329.
See Igna Coal Co. v. Becker, 130 Ill. App. 40, p. 42.

In an action for the death of a miner on the ground of wilful negligence of the mine operator to furnish props and cap pieces at the request of the deceased, a complaint or petition is sufficient which alleges in general terms that the deceased sent up a request for props and cap pieces which were not furnished him pursuant to such request. Proof that the deceased attempted to borrow props on the day of his injury from other parties is immaterial, but its admission in evidence is not a ground for reversal of the case.

O'Fallon Coal & Min. Co. v. Laquet, 198 Ill. 125, p. 126;
O'Fallon Coal & Min. Co. v. Laquet, 89 Ill. App. 13, affirmed.

In an action for damages by an injured miner against a coal mine operator for a wilful violation of the statute in that the operator failed to supply the miner with props, caps and timbers on proper demand as required by the statute, it is error for the court to instruct the jury on the subject of negligence, as it is only for wilful failure to perform the duty required by the statute that a recovery could be had under the pleading and under the statute.

Consolidated Coal Co. v. Stein, 122 Ill. App. 310, p. 312.

See Moore v. Centralia Coal Co., 140 Ill. App. 291, p. 297.

In an action by a miner for damages for injuries on the alleged ground that the mine operator failed to furnish props, where the evidence shows that repeated demands had been made on the mine operator for props on the day of the injury, and no evidence to the contrary was offered by the mine operator in defense, the admission of evidence proving demands for props on other days and at other times and that they were not furnished cannot be regarded as prejudicial error.

Hackart v. Decatur Coal Co., 149 Ill. App. 661, p. 662.

In an action by a miner for damages for injuries caused by an alleged failure of the mine operator to furnish props and caps, no recovery can be had by showing that some person other than the mine manager, although an agent or servant of the mine operator, had neglected or failed to furnish caps and props upon demand of the miner.

Swinosynski v. Kelly Coal Co., 146 Ill. App. 120, p. 123.

Under a complaint in an action for damages by an injured miner which alleged that the miner demanded 25 props and one cap piece for each of such props, it is sufficient for the plaintiff to prove to entitle him to recover that he made the demand as alleged and that the props and caps were not furnished to him.

Hackart v. Decatur Coal Co., 243 Ill. 49, p. 51;

Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271.

There may not be a recovery for injuries to a miner caused by the failure of the mine operator to supply props in compliance with the injured miner's request, where such request was not specific and failed to state the number or length or size of props and caps required; but there may be a recovery under the common law liability on the ground of negligence where the evidence shows that the operator negligently furnished insufficient, insecure, wormeaten and rotten props and that by reason thereof they were not of sufficient strength and not suitable for the purpose intended.

Hackart v. Decatur Coal Co., 243 Ill. 49, p. 53.

Where the evidence is conflicting upon the question whether props were needed to secure the roof of the room where a miner was at work when injured; whether the miner had requested that props be furnished him with which to secure the roof of his room, and whether the mine operator had failed and refused to furnish the miner with props of the requisite length to secure the roof after requested through its mine manager, are all questions of fact for the determination of a jury as to whether or not there was a wilful failure of the mine operator to comply with the provision of the statute.

Dickerson v. Henrietta Coal Co., 251 Ill. 292, p. 295.

Section 16 of the act of 1890 requires that the mine manager shall always provide a sufficient supply of props, caps and timber to be delivered on demand; but it is made the duty of the miner, not the manager or operator, to properly prop and secure his working place with the materials provided therefor. The

purpose of the statute was to aid the miners in protecting themselves against the dangers of a hazardous occupation and not a measure of a greater security for other employees. Only those having use for the props and the right to demand them can complain of a wilful failure on the part of the manager or operator to comply with a demand.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 241.

31. PROPS.—DUTY OF MINER TO REQUEST AND SET.

As the miner must make the roof of his room safe with the materials furnished by the mine manager, it follows that the demand contemplated by the statute must be made by the miner who is specially charged to make the roof secure, and the demand may be for such timbers as in his judgment should be required to accomplish this purpose.

Springfield Coal Min. Co. v. Gedutis, 127 Ill. App. 327, p. 329.

See *Western Anthracite Coal Co. v. Beaver*, 192 Ill. 333;

Kellyville Coal Co. v. Strine, 217 Ill. 516.

The act of 1909 is a revision of the act of 1879, which required a mine operator to supply props and cap pieces "so that the workmen may at all times be able to properly secure their workings for their own safety," and the duty is not in terms imposed upon the miners or workmen to use or place the props. But, by the present statute, the purpose of the props is for the securing of the roof by the miners and the duty is imposed upon the miners to prop and secure their places. The uncertainty under the old law is removed by clear and definite statements in this act.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 242.

It is the duty of a coal operator to furnish props, caps, or timbers to a miner when demanded; but it is made the duty of the miner to make a demand for the props, and he must designate the kind of timber he needs to prop his room, and it is the duty of the miner to properly prop and secure his place with the material when furnished.

Munier v. Chicago & Carterville Coal Co., 180 Ill. App. 114, p. 118.

The statute requires the miner to designate the length and sizes of the timbers he wishes to use in his room, and if no timbers are demanded of a particular length the miner can not be heard to complain if the timbers furnished are not of the length suitable to properly prop the roof.

Munier v. Chicago & Carterville Coal Co., 180 Ill. App. 114, p. 120.

The miner must be the one to determine the length and dimension of the props which he deems necessary to prop the roof for his own safety. If he orders six and one-half foot props, the owner or operator does not comply with the statute when he furnishes props which must be spliced or sawed before they can be used.

Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333;

Wojtylak v. Kansas & Texas Coal Co., 188 Mo. 260, p. 297.

A miner or employee in a mine injured while performing the necessary duty of putting in props and making dangerous conditions safe can not recover of the mine operator by virtue of any of the provisions of the statute, as he was himself only complying with the statute.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595;

Gallatin Coal Co. v. Andrewzewski, 137 Ill. App. 1;

Cappelin v. Jones & Adams Coal Co., 164 Ill. App. 267;

Driza v. Jones & Adams Coal Co., 171 Ill. App. 139, p. 144.

The fact that a miner has the right under this statute to demand the props, and the mine manager is under obligation to furnish the same, is proof that the miner regards the props as necessary. If the props are necessary, then the miner must know that there is some degree of looseness in the pieces of coal in the roof of the room which requires the placing of props to support it. But it can not be said that though he has knowledge as to the looseness of the coal his working in the room with such knowledge is such negligence as amounts to a proximate cause of the injury and thereby relieves the mine operator from liability.

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 529.

See Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 211;

Kellyville Coal Co. v. Strine, 117 Ill. App. 115.

In an action by a miner for damages for injuries caused by the alleged willful violation of the statute on the part of the mine operator in that props were not furnished, the evidence is sufficient to sustain a finding to the effect that the mine operator did not violate the statute where it is not shown that the miner made a demand for props, and where it is shown that there were sufficient props in the room at the time the miner was injured and where it also appears that the fall which injured the miner was from the face of the coal and was the coal which would be taken down by the miner in the usual course of his working in mining coal.

Munier v. Chicago & Carterville Coal Co., 180 Ill. App. 114, p. 118.

32. PROPS—SUFFICIENCY OF REQUEST—CUSTOM.

A demand on the part of a miner for props and caps may be general and not specific, but if the miner does not specify the number, size, or dimensions of props, caps or timbers that he requires, the mine manager may supply what in his best judgment will suffice for the purpose, and the number and kind to be supplied will necessarily vary with the situation and circumstances of the case, and the mine manager is guilty of willful violation of duty only in case he knows that those furnished are insufficient.

Hackart v. Decatur Coal Co., 243 Ill. 49, p. 51.

In its common acceptation the word "required" is not a synonym for the word "demanded" as implied by the statute. The former may relate to a condition arising by implication and is more commonly used as synonym with "necessary" while the latter in the sense in which it is implied in the statute relates to an express overt act. The interchangeable use of these words in an instruction as applied to props is misleading and such an instruction should not be given.

Thompson v. Dering Coal Co., 153 Ill. App. 289, p. 291;

Munier v. Chicago & Carterville Coal Co., 180 Ill. App. 114, p. 119.

A coal mine operator who has adopted and recognized a custom by which miners may order props and caps from the timberman and the timberman measure and determine the length of the props, is bound by such custom, and the timberman is the vice principal and his knowledge and neglect of duty is that of the mine operator.

Russell v. O'Gara Coal Co., 188 Ill. App. 328, p. 329.

Where a mine operator adopts an exclusive method whereby a miner is required to make his demands for necessary timbers, it must be held that a compliance by the miner with such method constitutes a demand for such timbers within the meaning of the statute and a failure on the part of the mine op-

erator to comply with the demand so made constitutes a willful failure within the meaning of the statute.

Vindas v. Dering Coal Co., 145 Ill. App. 528, p. 531;
Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271.

Where a custom or general usage exists in a mine that timber orders shall be signed by a miner and placed in a box provided for that purpose by the mine operator, the signing of such an order by a miner and depositing the same in a box provided, constitutes in law a demand for timbers upon the mine manager and mine operator, and a failure to comply with such demand when so made is a willful failure by the mine operator within the meaning of the statute.

Vindas v. Dering Coal Co., 145 Ill. App. 528, p. 531.
Brazil Block Coal Co. v. Hotel, 192 Fed. 108.

See Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271.

A demand made by a miner for props upon a mule driver is not sufficient as a demand upon the mine operator or manager, for if the driver failed to convey the order to the manager he would be at fault and not the manager, and the owner or operator could not be held liable for such negligence on the part of the driver. If, as at some mines, there is a custom to write the orders for props on a blackboard in the mouth of the shaft, then it would be the duty of the operator to examine the blackboard at frequent intervals to see what orders were written there. But an uncommunicated demand on the part of the driver of a car is not sufficient to place responsibility upon the owner or operator.

Henrietta Coal Co. v. Martin, 221 Ill. 460, p. 469;

Donk Bros. Coal & Coke Co. v. Lucas, 226 Ill. 23, p. 26.

See Pana Coal Co. v. Becker, 130 Ill. App. 40, p. 43;

Yanloniz v. Spring Valley Coal Co., 185 Ill. App. 563, p. 567.

In an action by a miner for damages for injuries caused by the failure of a mine owner and operator to furnish props and timbers, the evidence showed that there was a custom or usage established by the mine operator as to the manner in which the miner should make his demand for props and caps. According to this custom or usage, the miner, when he desired to have props and caps, wrote with chalk on a blackboard, placed near the mouth of the shaft for that purpose, the number of props and caps wanted and the length of the props, and on this demand the props would be sent down to him and the driver would deliver them at the miner's door. In the particular action, the evidence showed that the miner was in need of props and caps and that for three successive days before the injury he placed orders for them on the blackboard, but they were not furnished pursuant to his request. This mode of making a demand for props and caps was a reasonable and proper one and, as it was the mode adopted and in general use, it constituted a sufficient demand on the mine manager within the meaning of the statute.

Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41, p. 45;

Donk Bros. Coal & Coke Co. v. Peton, 95 Ill. App. 193, affirmed;

Pareba v. Illinois Midland Coal Co., 156 Ill. App. 140, p. 143.

See Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333, p. 335;

Pana Coal Co. v. Becker, 130 Ill. App. 40, p. 42.

A demand by a miner for props is sufficient where it was the custom of the miners to demand props of the driver and for a timberman to come to the room and saw the props of proper length; and the failure to furnish props on a demand by a miner of the driver is a willful violation of the statute making a mine operator liable for any resulting damages.

Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271;

Kedes v. Christian Co. Coal Co., 149 Ill. App. 434, p. 437.

The custom of ordering props from a driver is reasonable and proper and, where known to the miners and to the mine manager, has the effect of making a

notice to a driver notice to the mine manager. A demand made in conformity with the custom or mode adopted and in general use in the mine is a sufficient demand upon the mine manager.

Pana Coal Co. v. Becker, 130 Ill. App. 40, p. 42;
Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41.
 See *Henrietta Coal Co. v. Martin*, 221 Ill. 460.

It is proper for a miner in an action for damages for injuries caused by the failure of the mine operator to furnish props to show a demand made upon a driver for the props, where the mine manager had expressly established the rule that the miner should request props from drivers.

Donk Bros. Coal & Coke Co. v. Lucas, 226 Ill. 23;
Yanloniz v. Spring Valley Coal Co., 185 Ill. App. 563, p. 567.

Where a custom existed in a mine for the miners to order props from the drivers and thereupon props were sent in and a timberman cut and adjusted the props to the required length, a mine operator, who failed to furnish props, under such custom can not, in an action by a miner for damages for injuries received on the ground of a wilful violation of the statute in that the mine operator failed to furnish props, avoid liability on the ground that the miner failed to request props of a particular kind or specified length.

Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 274.
 See *Vindas v. Dering Coal Co.*, 145 Ill. App. 528.

In the absence of proof of a custom to that effect a miner can not show that he made a demand upon a driver for props.

Yanloniz v. Spring Valley Coal Co., 185 Ill. App. 563, p. 567;
Brack v. Berry Coal Co., 174 Ill. App. 609.

33. VENTILATION.

The safety of men and animals for which provision is made in this section relates to the sanitary condition as affected by inadequate ventilation and the breathing of impure air and poisonous smoke and vapor constituting deleterious air.

Carterville & Herrin Coal Co. v. Moake, 128 Ill. App. 128, p. 135.

A mine operator who knowingly violated the statute in that he failed to properly ventilate the rooms and working places of the mine and the mine examiner failed to discover and mark the dangerous places including a room in which gas was known to accumulate, and where the marks and notices had been placed as a precautionary measure only, cannot in an action by a miner for injuries caused by an explosion in a room where the miner was working, defeat the action on the ground that the miner was negligent in going beyond the place so marked. Contributory negligence in such cases cannot be interposed as a defense to an action for a violation of the statute.

Turner v. Manufacturers & Consumers Coal Co., 161 Ill. App. 534, p. 538.
 See *Merlo v. Johnston City & Big Muddy Coal & Iron Co.*, 173 Ill. App. 425, p. 430.

In an action by a miner for damages resulting from sickness caused by the alleged violation of the statute in that the mine operator wilfully failed to force into the working place of the complainant currents of fresh air by reason whereof great quantities of carbonic oxide, powder, smoke, gas, coal dust and deleterious air accumulated in consequence of which the complainant became ill, his system poisoned, and his throat, lungs and head affected and injured, there may be a recovery under evidence showing that the illness complained of could have been caused by such injurious conditions existing at the miner's working place and the jury may conclude that the violation of the statute complained of was the

proximate cause of the existing injuries and illness, where there was a total absence of any proof tending to show the existence of any other conditions which could, under the evidence, have produced the same result.

King v. DeCamp Coal Min. Co., 161 Ill. App. 203, p. 204.

84. DOORS—DUTY TO EMPLOY ATTENDANTS—GOOD FAITH.

The principal purpose of section 19 is to provide for ventilation and doors are necessary to guide and direct the air currents. Clause (e) provides that all permanent doors used in guiding and directing the ventilating currents shall close automatically, and the existence of the necessary doors create a source of danger to those who are driving cars and the provision requiring an attendant in charge of each principal door is presumably that he may open it at proper times and with proper and suitable caution to prevent injury. It could not have been intended that a person stationed at a door to open and close it for the passage of cars would open it at improper times when collisions with other cars would probably result. The presence of an attendant performing his duty as required by the statute would tend to secure the safety of the driver and in view of the danger it was the purpose of the act to provide against dangers resulting from the existence of the necessary obstructions in the form of doors. It was not contemplated that an attendant would open a door whenever a car came along a track regardless of consequences and without the exercise of any care.

Himrod Coal Co. v. Stevens, 203 Ill. 115, p. 118;

Himrod Coal Co. v. Stevens, 104 Ill. App. 639, affirmed;

Madison Coal Co. v. Hayes, 116 Ill. App. 94, p. 97.

The failure on the part of a mine owner or operator to employ an attendant to open and close a door in a mine which is necessary for the ventilation of a portion of the mine, and through which trips of cars pass to and from the workings, is a wilful violation of this section of the statute, if the evidence shows that the door was a principal door in the mine.

Karkowski v. La Salle County Carbon Coal Co., 248 Ill. 195, p. 200.

The failure of a mine operator to station a trapper or attendant at a principal door to open and close the same when trips of cars are passing to and from the workings is a wilful omission to obey the statute and renders the mine operator liable to a driver injured by reason of such omission.

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 403.

A driver put a sprag in the wheel of his car and came down an incline, through a crosscut with his mule on the run, the door closing the haulage way swung each way and closed automatically, and the custom was, in the absence of an attendant at the door for the mule to push it open with his nose and pass through then it would close after the car. On the particular occasion of the injury complained of the mule pushed the door open with his nose going through on a run and collided with another car at the junction by reason of which the driver was thrown off and injured. The mine operator was held liable in damages as for a wilful violation of the statute in failing to keep an attendant at the door as required by this section of the mining law.

Himrod Coal Co. v. Stevens, 203 Ill. 115, p. 116;

Himrod Coal Co. v. Stevens, 104 Ill. App. 639, affirmed.

See *Madison Coal Co. v. Hayes*, 116 Ill. App. 94, p. 97.

Section 19 of this statute requires all permanent doors in coal mines used in guiding and directing the ventilating currents to be hung so as to close automatically; and at all principal doorways through which cars are hauled an attendant shall be employed and stationed to open and close the doors. Clause (e) of this section was not enacted solely for the purpose of securing proper

ventilation of the mine, and the right to maintain an action for injuries, caused by the failure of the operator to comply with the statute in this respect, is not limited to cases of injury resulting from the want of necessary ventilation because of the failure to have doors so hung. Doors which close automatically are required for the protection of those who are in danger of receiving injury because of the necessity that the doors shall be closed after having been opened to permit passage through them. This rule applies to a driver who was compelled to open and close the doors and who was injured while closing a door.

Madison Coal Co. v. Hayes, 215 Ill. 625, p. 626;

Karkowski v. La Salle County Carbon Coal Co., 248 Ill. 195, p. 198.

If good faith would relieve the operation of a mine from the charge of a wilful violation of the statute, it must be the good faith of the operator of the mine and if the operator is a corporation then the good faith of its executive officers. The executive officers of a corporate mine operator must know that a certain doorway is a principal doorway at which a trapper should be employed, but by employing a man and calling him a mine manager the corporation could be relieved from liability by having him swear that he really and in good faith believed that it was not a principal doorway; and thus the benefit intended by the statute could be frittered away and the operator of a mine relieved from liability in every case.

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 406.

In an action by a driver for damages for an injury under a count charging that the complainant was hauling coal from a certain stub-entry through a principal doorway in such entry and the mine operator wilfully failed and neglected to keep a trapper to open and close the same and on this account the complainant was injured, the complainant must prove, to entitle him to recovery, that the doorway where he received the injury was a principal doorway within the meaning of the statute.

Madison Coal Co. v. Hayes, 116 Ill. App. 94, p. 96.

See Himrod Coal Co. v. Stevens, 203 Ill. 115.

35. DOORS—PERMANENT, PRINCIPAL, OR TEMPORARY—MEANING.

Whatever the statute may mean by the term "principal doorway," certainly the doorway in a hauling way between which loaded cars pass and the door which must be kept closed or the workmen driven from some portion of the face of the coal from the lack of air, ought to be considered a principal doorway. The purpose of the statute was to protect the miners at work and a driver while driving his trip.

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 403.

Any doorway is a principal doorway and within the meaning of this act, which is essential to the ventilation of any portion of the face of the coal where miners are at work and which is in frequent, regular and habitual use for the hauling of cars while coal is being mined.

Madison Coal Co. v. Hayes, 215 Ill., p. 625;

Karkowski v. La Salle County Carbon Coal Co., 248 Ill. 195, p. 198.

See Himrod Coal Co. v. Stevens, 203 Ill. 115;

Himrod Coal Co. v. Stevens, 104 Ill. App. 639.

The question as to whether or not a door in a mine is a "principal door" within the meaning of this statute is a question of fact.

Himrod Coal Co. v. Stevens, 203 Ill. 115;

Madison Coal Co. v. Hayes, 215 Ill. 625, p. 628;

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 403.

See Karkowski v. La Salle County Carbon Coal Co., 248 Ill. 195, p. 198;

Himrod Coal Co. v. Stevens, 104 Ill. App. 639;

Madison Coal Co. v. Hayes 116 Ill. App. 94, p. 97.

The quantity of coal remaining to be mined in a mine or in any entry thereof furnishes no criterion for determining whether a door is a permanent door within the meaning of the statute. (Sec. 19.) If a door is to be used indefinitely, as long as it is necessary that a door be maintained at a particular place, it is to be regarded as a permanent door. So a door intended to be maintained as long as coal remains to be mined and removed is not a temporary door, but is a permanent part of the mine, and a permanent door within the meaning of this clause of the statute. The failure of a mine owner and operator to provide a door that will close automatically as required by the statute will render him liable in damages to a trip driver injured while attempting to close the door.

Madison Coal Co. v. Hayes, 215 Ill. 625, p. 628.

The fact that section 19 only requires an attendant to be kept at doorways, through which cars are hauled, to open and close the door shows that the legislators had in mind, when enacting the statute, something concerning the hauling of cars. They may have thought that if the drivers themselves undertook to open and close the doors they might sometimes leave them open. That the safety of the drivers was also contemplated is clear, as in some of the entryways in mines, where mules are used to draw trips which pass through doorways, the space between the load and the roof and the car and the sides of the doorways is frequently very slight. A driver could get off the front of his car, pass the mule, open the door and return to his seat without particular danger, but if he should let his loaded car pass, close the door and seek to regain his position on the car he might be imperiled or he might have no certain way of causing the mule to stop after passing through the doorway. Such a construction of the statute would not necessarily make all doorways through which cars were hauled principal doorways and would not give to the word "principal" its true significance.

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 402.

In an action by a driver for damages for injuries under a count alleging that the complainant was employed by a mine operator as a driver and engaged in hauling coal from a certain entry through a certain doorway, and that such doorway was a permanent one used for the purpose of guiding and directing the currents of air, and that the mine operator willfully neglected and failed to construct such doorway so that it would close automatically, and that by reason thereof the complainant was injured, the complainant, in order to recover, must prove that the door used as alleged was a permanent door.

Madison Coal Co. v. Hayes, 116 Ill. App. 94, p. 96.
See Himrod Coal Co. v. Stevens, 203 Ill., 115.

36. DOOR ATTENDANTS REQUIRED—PURPOSE OF STATUTE.

The legislative purpose in requiring the employment of an attendant at each particular door was to provide for the safety of those employed in the mine by its proper ventilation, and for the safety of drivers employed in a mine while passing to and from the workings therein through such principal doorways.

Halberg v. Citizen's Coal Min. Co. 149 Ill. App. 412, p. 414.

While the principal purpose of section 19 is to provide for the ventilation of a mine, the requirements of attendants at all principal doorways is not de-

signed solely for the protection against injuries arising from improper ventilation, but also to secure the safety of drivers from dangers resulting from the existence of the doors.

Himrod Coal Co. v. Stevens, 203 Ill. 115;

Madison Coal Co. v. Hayes, 215 Ill. 625;

Karkowski v. La Salle County Carbon Coal Co., 248 Ill. 195 p. 197.

See Himrod Coal Co. v. Stevens, 104 Ill. App. 639.

The statute is silent as to why and for what purpose doors are to be opened and closed by attendants. But the act requiring this was passed for the purpose of promoting the health and safety of persons employed in coal mines, and naturally all dangers to the health and safety of miners which an observance of the required provisions would obviate fell within the contemplation of the legislature. If the sole purpose of the provision requiring an attendant at each principal door was to secure ventilation, then the duty of opening the door could not be cast upon the attendant because it is a closed door that deflects the air current and prevents it from going in the wrong direction. The principal doors are usually placed near a point where entries join and near junction of mine tracks and at these points there is always danger of collision and it is reasonable to suppose the purpose of requiring the attendant to open the door was to promote safety to drivers and shield them from the dangers of collision.

Himrod Coal Co. v. Stevens, 104 Ill. App. 639, p. 643.

There is some ambiguity in the provisions of this act requiring an attendant at each principal door in a mine, but where a statute regulating the manner of conducting an industry is ambiguous or indefinite, a court will receive, as an aid to proper interpretation, the construction which practical persons engaged in the industry have placed upon it. And where a mine operator placed attendants or trapper boys at the principal doors in the mine, who were charged with the duty of flagging drivers and preventing them from coming together, courts will assume that the purpose of requiring an attendant was for the safety of the miners.

Himrod Coal Co. v. Stevens, 104 Ill. App. 639, p. 644.

37. CROSSCUTS—PURPOSE—FAILURE TO MAKE—LIABILITY.

It is a matter of general knowledge that the opening of crosscuts between entries in a mine develops and protects air currents forced by a fan through the mine and removes deleterious air, and the opening of such crosscuts greatly promotes the protection of miners from injuries from bad air, caused by an explosion of gases or otherwise; and it must be assumed that the legislature in providing for the opening of crosscuts intended to protect miners and if an entry could be extended to an indefinite distance without opening up a new crosscut, as the work advances, provided no room was turned off of the entry, the object of the law would be to some extent subverted. The meaning and intent of the statute is that crosscuts shall be opened up at intervals of 60 feet as entries are extended, and the failure to do so is a willful violation of the statute rendering the mine operator liable for injuries proximately resulting from such failure to comply with the statute.

Smith v. Moffat Coal Co., 151 Ill. App. 362, p. 366.

38. EMPLOYMENT OF BOYS—REPEAL—CHANGE OF AGE.

This act as to the prohibition of employment of boys under the age of 14 years in coal mines was repealed by implication by section 11 of the Child

Labor Act of 1903 and the age limit for employment of boys in coal mines was changed from 14 to 16 years.

Struthers v. People, 116 Ill. App. 481, p. 488.

39. FAILURE TO INSTRUCT OR WARN—LIABILITY.

Coal mine operator may be liable in damages for the death of a miner on the ground of a willful failure of the operator in failing to give special attention to and instructions concerning the time and manner of placing and discharging blasting shots, where the deceased miner was employed under his certificate showing he qualified to perform the work of a miner and where he was not employed as a shot firer, was not an experienced shot firer and the operator had in fact failed to give him any instructions concerning the time and manner of placing and discharging the blasting shots.

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 388;

Wendzinski v. Madison Coal Co., ——— Ill. ———, 118 N. E. 435.

Where a person employed in a mine as a track layer, and while so engaged was ordered and required by an assistant mine manager or person acting as a mine manager to help certain timbermen to timber the roof of an entry, which work the track layer had never performed and of the dangers incident thereto he did not know, and where the mine manager failed to warn or instruct him, the mine operator is liable in damages for injuries to such track layer caused by a fall of slate and rock from the roof.

Tygett v. Sunnyside Coal Co., 140 Ill. App. 77, p. 78.

Where a mine manager or his assistant recklessly ordered a track layer into a place of danger without proper warning, the mine operator is liable for resulting injuries.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595;

Tygett v. Sunnyside Coal Co., 140 Ill. App. 77, p. 83.

40. FELLOW SERVANTS—INSTANCES.

Fellow servants are those whose duties are such as to bring them into habitual association so that they may exercise a mutual influence upon each other promotive of proper caution, and under this rule neither the bottom nor top cages nor the engineer who operated the cage or elevator is a fellow servant with a miner carried in and out of the mine by the cage or elevator.

Illinois Third Vein Coal Co. v. Cioni, 215 Ill. 583, p. 589.

A holsting engineer at a mine is not a fellow servant with the miners with respect to operation of the cages in which the miners are carried in and out of the mine where their respective duties do not bring them into association with each other, nor in any manner require them to act or co-operate with each other, their duties being entirely disconnected.

Spring Valley Coal Co. v. Patting, 210 Ill. 342;

Illinois Third Vein Coal Co. v. Cioni, 215 Ill. 583, p. 592.

41. DANGEROUS CONDITIONS OR PLACES—MEANING—DUTY TO MARK—PLEADING.

Section 18, in requiring a mine manager to see that all dangerous places are marked, imposes upon him the duty of marking the places himself or causing it to be done by some other person, and if he caused a dangerous place to be marked it can not be properly said that he did not mark the place.

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 311.

The act of 1899 as amended by the act of 1907 was in force prior to July 1, 1911. It provided that a mine examiner should be required at all times, and

his duty was, to visit the mine before the men were permitted to enter. He was required to inspect all places where men are expected to pass or to work, and as evidence of his examination of all working places he must inscribe on the walls of each, with chalk, the month and day of the month of his visit.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 153.

What constitutes a dangerous condition in a mine is to be determined by the jury in an action for damages by a miner for injuries upon the circumstances of each particular case.

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 411;

Aetitus v. Spring Valley Coal Co., 246 Ill. 232.

The language of section 18 clearly implies that all dangerous places in a mine shall be marked and made safe, whether of a permanent nature or made so by changed conditions; and it can make no difference that the condition became or was dangerous by reason of defective permanent conditions. If the dangerous condition in fact existed at the time the miner was allowed to enter the mine to work in the mine, the statute fixed the duties of those in charge of the mine, and a conscious failure to observe these duties is willful negligence.

Dunham v. Black Diamond Coal Co., 146 Ill. App. 140, p. 142.

The words "any dangerous conditions exist" as used in this statute clearly intend to cover all dangerous conditions which might exist in a coal mine which would endanger the life, limb, or health of men working in such mine and are not limited to dangerous conditions of the character only of "accumulations of gas or recent falls," but cover a dangerous condition in roof of an entry or room.

Mertens v. Southern Coal & Min. Co., 235 Ill. 540, p. 545.

See *Kellyville Coal Co. v. Strine*, 217 Ill. 516;

Henrietta Coal Co. v. Martin, 221 Ill. 460.

A miner under the statute is entitled to the benefit of the superior knowledge and experience of the officers charged with the duty of discovering such conditions in the mine; and if a dangerous condition is proved to be at any working place in the mine regardless of the object or purpose in producing such condition, then it must be marked, even though the condition may have been produced by the miner. If it is present at the time of the examination by the mine examiner, he must mark it as dangerous.

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 411.

The words "any dangerous conditions," used in section 18 of this act, apply to dangerous conditions in the track, the roadbed, or the sides of the entries, and include any dangerous conditions which may exist in a coal mine which endanger the life, limb, or health of one working in the mine, whether such conditions are of permanent character, due to faulty construction or of a temporary character due to operation.

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 309.

See *Mertens v. Southern Coal Co.*, 235 Ill. 540.

The statute (sec. 18) applies to dangerous conditions in a mine such as in the track over which cars are drawn or in the roadbed or the sides of the entries by which the mine is traversed as well as dangerous conditions caused by the falling of rock and other debris.

Dunham v. Black Diamond Coal Co., 239 Ill. 459;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 375.

The condition of a track in a mine over which drivers must pass with their mules and cars is as much a physical condition and subject to examination

and marking by the mine examiner as required by the statute as the condition of the roof over a hauling way.

Felchner v. Consolidated Coal Co., 176 Ill. App. 411, p. 415.

It is a dangerous condition within the meaning of the statute where wooden rails are used to piece out or extend a railroad track in a mine, leaving a sharp decline with dangerous holes between car ties, by reason of which a miner was injured in an effort to prevent a car from escaping.

Leverich v. Danville Collieries Coal Co., 193 Ill. App. 627, p. 630.

A mine operator, who permits the railroad tracks and frogs over certain parts of an entry to be and remain uneven, out of line and in a dangerous and unsafe condition and fails to have his mine inspected and cause a conspicuous mark to be placed at such place of danger and permits a driver to enter the mine and work therein, not under the direction of the mine manager when such dangerous condition has not been made safe, is liable in damages to a driver of a car injured in a collision with a car that had been thrown from a track by reason of such dangerous condition of the rails and frogs, on the ground of the mine operator's wilful violation of the statute.

Davis v. Big Muddy Coal & Iron Co., 173 Ill. App. 162, p. 166.

See *Dunham v. Black Diamond Coal Co.*, 239 Ill. 459;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 375;

Felchner v. Consolidated Coal Co., 176 Ill. App. 411, p. 415.

It is sufficient, in an action by a miner for injuries, for the declaration to aver that the plaintiff was employed by the defendant as a miner or as a driver and that he was at the time of the injury working as such in the defendant's mine; that the track over which the complainant was required to haul coal was defective in that the ties underneath the track were rotten, the spikes loose and the condition of the track such as to cause the motor to swing and bounce and by reason thereof the complainant was thrown from the motor and injured; that such condition had existed for many weeks and that the mine operator had failed to cause the same to be marked as required by the statute and had permitted the miner to enter the mine and work in such dangerous place without having the same made safe.

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 377.

See *Keller v. Chicago-Wilmington & Vermillion Coal Co.*, 184 Ill. App. 248, p. 250.

In an action by a driver for damages for injuries occasioned by the operation of his car by reason of an accumulation of gob at the side of the track, the mine operator can not escape liability on the ground that the mine examiner had not reported the particular condition as dangerous, where the accumulation of the gob was an obvious danger and had existed for a considerable time prior to the day of the accident and was one which the mine operator should have known of and removed prior to the alleged injury. The words "all conditions" used in the statute can not mean only such dangerous conditions as the report of the mine examiner may show to be such.

Olson v. Kelly Coal Co., 143 Ill. App. 260, p. 273.

An entry in a mine the roof of which is so low as to be dangerous to employees and miners rightfully traveling therein is a dangerous condition within the spirit of the act that requires marking, and it is the duty of the operator to cause it to be conspicuously marked and a report and record made, and not to permit miners to use the entry until the dangerous condition is removed.

Magnani v. Spring Valley Coal Co., 193 Ill. App. 107, p. 108.

The mining statute does not describe the height of entries. The lawmakers understood that veins of coal differ in thickness and while a high entry would

be practicable in a thick vein it would not be so in a thin one; and it is not a dangerous condition within the meaning of the statute to have a low entry or an entry lower at one point than at another.

Jacobs v. Madison Coal Corp., 165 Ill. App. 444, p. 448.

A piece of loose slate projecting over the retaining wall of a roadway may be a dangerous condition although the mine examiner examined the place on the day of the accident and found no dangerous condition, but the fact that the slate was loose tends to show that the mine examiner failed to particularly examine the edges of the fall as required by the statute, and under such circumstances a mine operator is liable for injuries to a common laborer engaged in removing debris from the track in the roadway.

Demereski v. Citizen's Coal Min. Co., 149 Ill. App. 513, p. 515.

A block of coal sufficient in size to weigh from 300 to 500 pounds blown out of the face of the coal by shot firers in the course of mining operations and lying near the car tracks, is not such an obstruction or dangerous condition within the meaning of the statute as requires the mine examiner to place a conspicuous mark thereon and report the same as a dangerous condition in a mine.

Kean v. Jones Bros. Coal & Min. Co., 147 Ill. App. 319, p. 322.

Loose material on the floor at the entrance to a cross cut creates a dangerous condition within the meaning of the statute and a failure of the mine examiner to mark and report the same is a willful violation of the statute where such loose material had existed for some time; and it must be regarded as the direct and proximate cause for the injury complained of where a shot firer, after lighting the fuse or squib and in attempting to seek a place of safety, fell over and upon such loose material and was injured by the blast that followed.

Tomasi v. Donk Bros. Coal & Coke Co., 169 Ill. App. 47, p. 50.

See Tomasi v. Donk Bros. Coal & Coke Co., 257 Ill. 70, p. 73;

Davis v. Big Muddy Coal & Iron Co., 173 Ill. App. 162, p. 167.

The fact that men are engaged under the direction of the mine manager in cleaning up a coal mine after a shut down of several months and working under his general directions to make dangerous places safe, does not relieve the mine owner of the duty of having the mine examined by the mine examiner and the placing of a conspicuous mark on the dangerous places or conditions.

Piazzi v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 33;

Wilson v. Danville Collieries Coal Co., 264 Ill. 143, p. 146.

Section 18 is unreasonable on the theory that it would be impossible to operate a coal mine lawfully where hundreds of men are employed if none were permitted to enter until every dangerous condition had been made safe. But to say that a miner should not be permitted to enter the mine until some dangerous places distant from his working place and to which danger he would not be exposed should be made safe would be absurd. The purpose of the law is to protect the miner from exposure to dangers and from his own carelessness; to keep him away from dangers to which he would be exposed in the line of his employment until they are removed. If he is kept out of the mine there will be no exposure to danger. It is no strained construction to hold that it is a willful violation of the statute to permit a miner to enter a mine to work where a dangerous condition exists and to which dangers he will be exposed, not under the direction of the mine manager.

Merlo v. Johnston City & Big Muddy Coal & Iron Co., 173 Ill. App. 425, p. 429.

The provisions of section 18 require a mine examiner to inspect and mark unsafe and dangerous conditions in working places and do not apply to machinery several hundred feet distant by which a trip hauler was injured, and do not apply to dangers and unsafe hauling tracks, but apply to physical conditions which make a working place dangerous.

Cook v. Big Muddy Min. Co., 249 Ill. 41;

Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 198;

Felchner v. Consolidated Coal Co., 176 Ill. App. 411, p. 414.

Proof that an entry was in a "fair" condition is not sufficient to show that its condition was safe within the meaning of the statute.

Junction Min. Co. v. Ench, 111 Ill. App. 346, p. 353.

42. DANGEROUS CONDITIONS—PLACES ABOVE GROUND.

The words "in dangerous condition" used in section 18 are not limited to the dangerous conditions expressly specified in the act or to those of the same mine as those specified. The statute is broad enough to cover dangerous conditions existing at the top as well as at the bottom of the mine.

Fuchs v. Consolidated Coal Co., 157 Ill. App. 41, p. 45.

See Spring Valley Coal Co. v. Greig, 226 Ill. 511;

Dunham v. Black Diamond Coal Co., 239 Ill. 457;

Pierce v. Decatur Coal Co., 158 Ill. App. 192, p. 195.

The words "in dangerous condition" used in the statute apply to a dangerous condition at the top of the mine and at the tippie, where the coal cars were elevated and emptied at the tippie directly above the shaft, and the place was made dangerous by reason of the constant falling of lumps or pieces of coal while the cars were being emptied at the tippie and such lumps and pieces of coal falling down the shaft.

Fuchs v. Consolidated Coal Co., 157 Ill. App. 41, p. 45.

The provision in section 18 of this act making it the duty of the mine manager to see that all places both above and below were properly marked with danger signals was amended by the act of 1911 and the duty of the mine examiner to make examinations was limited to the underground workings of a mine.

Rogers v. St. Louis-Carterville Coal Co., 254 Ill. 104, p. 108.

Section 18 cannot by any construction be extended in its operation to a carpenter or to a place where a carpenter was employed by a coal mine operator to erect and repair buildings outside of the mine and to repair cars, and especially so where the injury sued for was the result of the carpenter's own negligence and forgetfulness in leaving a heavy timber in such a position that it subsequently fell upon him and injured him. The mine examiner is not under the statute required to examine and mark such a place as a dangerous place.

Rogers v. St. Louis-Carterville Coal Co., 254 Ill. 104, p. 107.

See Donaldson v. Spring Valley Coal Co., 175 Ill. App. 224, p. 229.

43. DANGEROUS CONDITIONS—ELECTRICAL APPLIANCES—EXCESSIVE VOLTAGE.

The dangerous conditions contemplated by section 18 clearly include a live wire so placed in the mine that a driver or his mule is exposed to contact therewith while in the mine, and from which an injury might result.

Dunham v. Black Diamond Coal Co., 239 Ill. 457, p. 459;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 375.

The presence of a live uninsulated electric wire in an entry with which a driver or mule might come in contact, is a dangerous condition within the meaning of section 18 which it is the duty of a mine examiner to discover and report.

Dunham v. Black Diamond Coal Co., 239 Ill. 457.

See Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 309.

The maintenance of an imperfectly insulated electric wire in an entry through which men pass in such a position that they are likely to be exposed to contact with it is a dangerous condition in the mine within the meaning of this section, which is the duty of the mine examiner to observe and mark.

Dunham v. Black Diamond Coal Co., 239 Ill. 457.

See Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 198, p. 205;

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 309.

A wire cable extending from an engine room to the cars used to haul coal up an incline and which swayed violently when the engine was in motion and hauling the cars at a rapid rate of speed, and near which the engineer was required to stand when watching the cars to tell when they reached their destination and stop the engine, and by reason of which the engineer was killed, was a dangerous condition at the working place of the engineer which the mine manager should have discovered and marked. And under such circumstances the place where the engineer was working and the machinery with which he performed his work constituted a part of the mine which the operator was required by the statute to have examined for the purpose of determining whether the place for employees to work in was safe.

Spring Valley Coal Co. v. Greig, 226 Ill. 511.

See Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 198, p. 205;

Rogers v. St. Louis-Cartersville Coal Co., 254 Ill. 104, p. 108;

Spring Valley Coal Co. v. Greig, 129 Ill. App. 386, p. 392.

The carrying of a 550 voltage or any voltage in excess of 275 volts is a violation of section 17 of the act of 1911, and renders a mine operator liable for any resulting injury.

Smith v. Consolidated Coal Co., 183 Ill. App. 572, p. 574.

A voltage in excess of that prohibited by section 17 of the act of 1911, must be regarded as the proximate cause of an injury to an employe and machinist, employed to keep the coal cutting machines in running order, where he sustained injuries because of an electric shock while taking a file from a box on the motor with which to make necessary repairs.

Smith v. Consolidated Coal Co., 183 Ill. App. 572, p. 576.

An employee engaged in repairing machines is entitled to recover damages for injuries caused by an electric shock where he put his hand in a tool box on a motor used by the motorman to hold certain tools, and into which the motorman had placed the file of the machine, and where, in attempting to remove the file, it became connected with the current generated for the motor and by reason of which the machinist received the injuries complained of and where the evidence showed that the voltage carried exceeded 275 volts.

Smith v. Consolidated Coal Co., 183 Ill. App. 572, p. 574.

44. DANGEROUS CONDITIONS—DETERMINATION—GOOD FAITH.

If a dangerous condition exists in a working place in a mine the mine examiner has no authority to determine that the place is not dangerous contrary to

the fact, and the mine owner cannot excuse himself for a failure to mark the place on that ground.

Eldorado Coal & Coke Co. v. Swan, 227 Ill. 586;
Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 51;
Hollingshead v. Wabash Coal Co., 142 Ill. App. 641, p. 644.

A mine operator who fails to mark dangerous places can not avoid liability on the ground that he had the mine examined and in good faith thought it was not dangerous.

Aetitus v. Spring Valley Coal Co., 246 Ill. 32;
Piazzi v. Kerens-Donnewald Coal Co., 179 Ill. App. 540, p. 544.

In an action by a miner for damages for injuries caused by the failure of the mine examiner to mark a dangerous place it is proper to refuse to permit the mine examiner to testify as to whether or not the entry or place in question was safe or otherwise. The determination of a mine examination that a place was safe although made in good faith does not excuse a mine operator from liability for failure to cause the place to be marked if it was in fact dangerous.

Gibson v. Wasson Coal Co., 190 Ill. App. 599, p. 602;
Leverich v. Danville Collieries Coal Co., 193 Ill. App. 627, p. 630.

The liability of a mine owner or operator as to the examination required does not rest upon the ground that in good faith or bad faith he thought there was no danger in the mine but upon the ground that he has, knowing the facts which made the mine dangerous, failed to have the statutory marks properly placed in the mine. When a mine owner or operator is advised of the conditions in a mine he must place in the mine, if it is dangerous, the statutory marks and if he fails to do so, he acts at his peril and he cannot excuse himself because he or his mine examiner or manager may think the mine safe, as this would permit the mine owner or operator or his examiner or manager to usurp the jurisdiction of the court or jury and pass upon a question which is a matter of principle and needs to be determined as a fact by a jury.

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 37.
See Catlett v. Young, 143 Ill. 74;
Odin Coal Co. v. Denman, 185 Ill. 413;
Davis v. Illinois Collieries Co., 232 Ill. 284;
Eldorado Coal & Coke Co. v. Swan, 227 Ill. 586;
Mertens v. Southern Coal & Min. Co., 235 Ill. 540;
Olson v. Kelly Coal Co., 236 Ill. 502;
McCarthy v. Spring Valley Coal Co., 232 Ill. 473;
Piazzi v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 33;
Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497, p. 504;
Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 276;
Noonan v. Saline County Coal Co., 173 Ill. App. 541, p. 546.

The fact that a mine examiner honestly concluded that a certain condition in a mine was not dangerous cannot relieve the mine operator from liability for an alleged violation of the statute where the evidence sufficiently showed that the place in controversy was in fact dangerous.

Lolli v. Spring Valley Coal Co., 193 Ill. App. 234, p. 236.

45. DANGEROUS CONDITIONS—KNOWLEDGE OR WANT OF KNOWLEDGE—CARE REQUIRED.

An operator of a coal mine is liable under the statute not only when the dangerous conditions have been discovered by him but also if by the exercise of care required by the statute he could have discovered the existence of such conditions.

Peebles v. O'Gara Coal Co., 239 Ill. 370, p. 374;
Brown v. Kelly Coal Co., 162 Ill. App. 65, p. 68;
Meugelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 378.

A dangerous place or condition in a mine need not be present or immediately pending. Safe and proper mining demands that probable, as well as present, conditions be guarded against.

Pareba v. Illinois Midland Coal Co., 156 Ill. App. 140, p. 143.

The statute does not contemplate that a mine owner shall be relieved from liability for an injury resulting to men working in his mine, in consequence of a dangerous condition in a mine of which he had actual notice, by reason of the fact that he has not received notice of such condition through the channel of the report of his mine examiner.

Olson v. Kelly Coal Co., 236 Ill. 502, p. 505.

A mine operator cannot be held liable on the ground of a wilful violation of the statute for the failure of the mine examiner to discover and mark a dangerous condition of the roof, where there were no physical facts that were visible or that could be ascertained by the means required by the statute and there was nothing to indicate a dangerous condition.

Wilkins v. Madison Coal Corp., 188 Ill. App. 416, p. 417.

46. DANGEROUS CONDITIONS—MARKING—WHAT CONSTITUTES.

It is not a compliance with the statute for a mine examiner to place an inscription on a small piece of board on the gob 18 feet back from the working face where the dangerous place actually existed.

Mertens v. Southern Coal & Min. Co., 140 Ill. App. 190, p. 192.

A mine operator may be liable for a wilful violation of the statute to a miner injured by an explosion in the mine, where such explosion occurred in an abandoned room into which the miner and his buddy had taken a car of refuse or waste, and the miner was injured by reason of an explosion of gas, the accumulation of which had existed in the room for several weeks prior, and of which the mine operator had actual knowledge. The fact that the mine examiner had placed on a board at the right of the entrance to the room the words "gas" or "gas in room" or "gas in hole" and had placed a tie across the end of the rails toward the face with a like notice thereon written in chalk, is not sufficient to relieve the operator from liability where it appeared that the words and marks so placed were not intended to keep the miners out of the particular room, but were merely intended as precautionary signals, and where the injured miner was at liberty to unload the cars of refuse in any proper and appropriate place and where the room in which he was injured was properly used as a room in which to unload refuse material.

Turner v. Manufacturing & Consumers Coal Co., 161 Ill. App. 534, p. 538.

See *Merlo v. Johnston City & Big Muddy Coal & Iron Co.*, 173 Ill. App. 425, p. 430.

A coal mine operator has discharged his duty under the statute when he obtains a duly certified examiner to examine the mine, and who marks the dangerous places with chalk and makes his report of the conditions of the mine as required by the statute; and the fact that there was so much water and dampness in the part of the mine where a miner was subsequently injured that the mine examiner's marks would often become invisible in a few minutes after they were made, would not show a wilful violation of the statute on the part of the mine operator, but would only show an imperfect performance of duty on the part of the mine examiner.

New Virginia Coal Co. v. Gower, 119 Ill. App. 1, p. 4.

See *Taylor Coal Co. v. Dawes*, 122 Ill. App. 389, p. 394.

Company-men are presumably skilled in caring for and keeping safe the mine and when called upon by a mine manager to remedy a defect or danger in the roof and in doing so they render the roof unsafe, it would be unreasonable to require a mine examiner to be present at all times to mark places which, while in the performance of their work, the company-men have themselves rendered unsafe. It is not necessary and it is not required that a danger mark be placed upon a rock as each new danger arises during the progress of the work, and particularly so where an assistant mine manager points out to the company-men the particular danger.

Paletta v. Illinois Zinc Co., 257 Ill. 11, p. 17.

47. DANGEROUS CONDITIONS—FAILURE TO MARK—LIABILITY.

Section 18 of the act of 1899 is an amendment of section 4 of the act of 1879 which required a mine to be examined, but it did not provide for the giving of a warning by a mark at the place of danger.

Kelleyville Coal Co. v. Strine, 217 Ill. 516, p. 522.

It is the duty of the mine operator to have his mine examined, and if dangerous conditions are found, to have them designated by the statutory marks, and a failure in either particular with knowledge of the dangerous condition or with knowledge of the facts from which he ought to have known of its dangerous condition, he is liable to an employee injured as a result of his wilful failure to obey the statute.

Aetitus v. Spring Valley Coal Co., 246 Ill. 232;

Cook v. Big Muddy-Carterville Coal & Min. Co., 249 Ill. 41;

Brown v. Kelley Coal Co., 162 Ill. App. 65, p. 68;

Jacobs v. Madison Coal Corp., 165 Ill. App. 444, p. 446;

Piazzi v. Kerens-Donnewald Coal Co., 179 Ill. App. 540, p. 544.

See *Smith v. Illinois Collieries Co.*, 155 Ill. App. 148;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 380.

Where a mine examiner failed to use reasonable diligence to discover dangerous places in an entry and had not placed a danger signal or the required marks on such dangerous place, and where the mine manager or his assistant recklessly ordered a miner in the place of danger without proper warning, the mine operator is liable in damages for any resulting injuries.

Kellyville Coal Co. v. Bruzas, 223 Ill. 596;

Smith v. Illinois Collieries Co., 155 Ill. App. 148, p. 150.

A failure of a mine examiner to properly mark and record a squeeze in a miner's working place caused by leaving insufficient pillars to support the coal and in permitting a miner to enter his working place before such dangerous condition had been removed is a wilful violation of the statute.

Wullner v. Smith-Lohr Coal Co., 145 Ill. App. 486.

See *Haywood v. Dering Coal Co.*, 145 Ill. App. 506;

Kedes v. Christian County Coal Co., 149 Ill. App. 434, p. 437.

It is a wilful violation of this statute for a mine examiner to fail to ascertain the condition of a pillar or supporting wall of coal through rooms and mark and report the place as dangerous, where such dangerous condition had existed for some days, and was in fact dangerous when the men went into the mine on the morning of the day the miner received the injuries complained of.

Franci, v. Tazewell Coal Co., 157 Ill. App. 437, p. 483.

The mine manager may not be required to perform the personal duty to mark a dangerous place; but an averment in a declaration to the effect that it was

the duty of the mine manager to see that a certain dangerous place was marked or danger signals placed thereat and averring his failure so to do is sufficient to show a breach of a statutory duty.

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 379.
See LeGru v. Penwell Coal Mining Co., 149 Ill. App. 555.

Where the evidence shows that from the entrance of a room to the face of the coal was an upgrade so that cars had to be spragged in taking them out of the room and the curve at the mouth of the room was very sharp and the rail on the outside of the curve was lowered, and cars had been derailed at such point and the mine manager notified of the condition several days previous to the accident resulting in the injury to the complainant and was requested to have the dangerous condition made safe; and where it appeared that the mine examiner himself passed over the place and examined the room but placed no mark or danger signal at the dangerous place and made no report thereof, it is sufficient to show a failure to comply with the provisions of the statute and to render the mine operator liable.

Felchner v. Consolidated Coal Co., 176 Ill. App. 411, p. 413.

When a mine operator is advised of a dangerous condition in his mine, he must place the statutory marks thereon, and if he fails to do so, he acts at his peril and can not excuse himself on the ground that the mine examiner or mine manager thought the place was safe.

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 412.

Section 21 of the statute of 1911, requires a mine examiner in discovering a dangerous condition in a room, to take the miner's check and deliver it to the mine manager, who should withhold it until all dangerous conditions are made safe, and not permit the miner to enter the room except for the purpose of making it safe. The failure of a mine examiner to mark the dangerous place and to take the miner's check as required is a violation of the statute, and the fact that a miner entered the mine and his working place and had actual notice and knowledge of the dangerous condition will not defeat his action for damages for injuries for the wilful violation of the statute.

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 485.

Where the roof of a mine was in a dangerous condition on the morning of a particular day and it appeared in an action by a miner for injuries caused by the fall of rock from the roof at such dangerous point, a jury may be justified in concluding that the mine examiner did not examine the room on that morning, or if he did examine it and discovered its condition, failed to comply with the statute by indicating by proper marks its dangerous condition and noting the same in his record and reporting it to the mine manager.

Mertens v. Southern Coal & Min. Co., 235 Ill. 540, p. 544;
Peebles v. O'Gara Coal Co., 239 Ill. 370, p. 373.

It is the duty of a mine operator to comply with the provisions of section 18 requiring him to make an examination of the roof of a mine and to mark thereon by conspicuous mark all dangers and unsafe conditions and to keep a record of the same, and a timberman whose duty it is to make dangerous places safe, and though injured while working under the direction of a mine manager, is entitled to recovery on the ground of a wilful violation of the statute where the mine examiner had failed to mark a dangerous place in the roof as required by the statute and which the timberman at the time was engaged in repairing.

Wilson v. Danville Collieries Coal Co., 184 Ill. App. 180, p. 182;
Wilson v. Danville Collieries Coal Co., 171 Ill. App. 65.

A coal mine operator may be liable in damages for the death of a car driver on the ground of a wilful failure to comply with the requirements of the statute in that a certain place in the haulage way the low roof of the entry scraped or dragged the coal from the loaded cars and thereby caused an accumulation of coal on the track amounting to a dangerous condition; and where it was charged and shown that the accumulation of the coal caused a coal car to be thrown from the track and the driver injured and where it also appeared that the mine examiner failed to examine and mark or report such dangerous condition.

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 309;

Crooks v. Tazewell Coal Co., 263 Ill. 343, p. 345.

A mine examiner by the proper examination of an entry or working place where a miner was required to work would have found the roof or place dangerous, and had he made a record to that effect and placed a conspicuous mark as required by law, it must be presumed that a miner would not have been permitted to enter the mine and would not have entered it for the purpose of mining until the conditions had been made safe.

Henrietta Coal Co. v. Martin, 221 Ill. 468;

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 485.

In an action by a miner for damages for injuries caused by the alleged violation of the statute on the part of the mine manager to properly mark a dangerous place and display signals, the words "display danger signals" may be treated as surplusage after plea filed, and where other allegations are sufficient to charge the mine manager with the failure to mark all dangerous places.

Dunham v. Black Diamond Coal Co., 146 Ill. App. 140, p. 143.

When working places are discovered in which any dangerous conditions exist a mine examiner must place a conspicuous mark thereat as a notice to all men to keep out and at once report his finding to the mine manager. That a dangerous condition existed at a place in question, was shown by the evidence. It also appeared that the examiner did not sound the place of most imminent danger and wholly failed to comply with the requirements of the statute as to marking and reporting the place as dangerous. Under such circumstances it was a proper question for the jury to determine whether the neglect of the mine operator was willful or not.

Stanhaus v. Paradise Coal & Coke Co., 169 Ill. App. 75, p. 80.

In the examination of a mine a mine examiner discovered a clod in the roof and sounded it with his pick and as it sounded solid he placed no danger mark at that place, subsequently a miner while working in that part of the mine was injured by the fall of clod. The liability of the mine operator on the ground of a willful failure to place a conspicuous mark at the dangerous point would depend on whether from the nature of the clod and the condition of the roof the clod was likely to fall and the place should have been marked by the examiner as dangerous was a question of fact for the jury to determine in the trial of the action for damages by the injured miner.

Piazza v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 33.

See *Wilson v. Danville Collieries Coal Co.*, 264 Ill. 143 p. 146.

48. DANGEROUS CONDITIONS—MARKING NOT REQUIRED.

Company-men were directed to blow off a portion of the roof of an entry in order to increase the height of the entry for working purposes. After the first shot was fired it was discovered that the shock had loosened a rock in the roof near where the shot had been placed and the company-men were immediately notified by the assistant mine manager to remove the rock before a second

shot was fired. Under such circumstances the statute does not require a mine examiner, or any one else to mark the rock with a danger signal as this would be a useless thing and would add nothing to the knowledge or safety of the company-men who were directed to remove the loosened rock.

Paletta v. Illinois Zinc Co., 257 Ill. 11, p. 17.

Where a mine manager discovered a loose and dangerous rock in the roof and called the attention of experienced miners to the rock and its danger and directed them to take it down and remove the dangerous condition, the statute under such circumstances does not require that the mine examiner shall place a mark on the rock. No danger signal is required to inform the miner that when he is taking down a rock it will fall as soon as its supports are removed. The very duty upon which he is engaged is to make the rock fall and a danger signal is not required to inform him that it will fall upon any person who stands under it when it comes down.

Paletta v. Illinois Zinc Co., 153 Ill. App. 506, p. 509.

A coal mine driver sued the mine operator for damages for injuries occasioned by a large block of coal weighing from 300 to 500 pounds, blown by shots some 30 feet from the face of the coal and about 9 inches outside of the car tracks. The cause of action was based on the alleged violation of the statute in that the mine examiner failed to mark and report the dangerous place and cause the same to be removed before the driver and other employees were permitted to enter the mine. The evidence on the trial of the case showed that the shooting down of the coal, the gathering of it up by the loaders and loading it in cars and the hauling of such loaded cars away by the mules in charge of their drivers, were all consecutive parts of the ordinary work of mining coal. It cannot be supposed that the statute intended that a mine examiner should mark as an obstruction, or as an unsafe condition, all pieces of coal of any considerable size blown out by the shot-firers in the course of mining and lying on or near to the tracks. The block of coal did not constitute such an obstruction or unsafe condition within the meaning of the statute as to require the mine examiner to conspicuously mark it as unsafe or to make special report of it in his record.

Kean v. Jones Bros. Coal & Min. Co., 147 Ill. App. 319, p. 322.

In an action by a miner for damages for injuries occasioned by a fall of coal on the alleged ground that the mine operator had wilfully failed and neglected to comply with the provisions of the statute in that he did not properly mark and display a danger signal at the bank of coal that fell and occasioned the injury complained of, an instruction authorizing a verdict for the complainant if the jury found that the dangerous condition was known to the mine manager and he did not personally properly mark and display a danger signal at the bank of coal is error for the reason that it authorized a recovery for the violation of an alleged duty not imposed by the statute.

Parrish v. Black Diamond Coal Co., 143 Ill. App. 118, p. 122;

Le Gru v. Penwell Coal Co., 149 Ill. App. 555, p. 558.

40. DANGEROUS CONDITIONS—RECORDS—WHAT CONSTITUTE.

Entries made in a book consisting of a set of printed reports, dated and signed by the mine examiner, occasionally adding something to the printed matter, as a report of a daily examination of a mine is not a compliance with the law; especially where the book was not kept in the office but in a small engine room not practically accessible to 400 miners, drivers, and laborers.

Marquette Third Vein Coal Co. v. Allison, 132 Ill. App. 221 p. 232;

Henrietta Coal Co., v. Martin, 221 Ill. 460.

A mine examiner marked the figures on the wall of an entry to indicate the month and day of his visit, but made no conspicuous mark at the place as notice to all men to keep out. In the record of his examination he stated that the working place in controversy and of the miner named needed bars, thereby indicating that it was unsafe. The mine operator can not escape liability for damages for an injury to a miner who was permitted to enter the mine and begin work in his working place, although the timbermen had been sent to the place to put in the proper bars as indicated by the mine examiner.

Hollingshead v. Wabash Coal Co., 142 Ill. App. 641, p. 645.

50. DANGEROUS CONDITIONS—WORK UNDER MINE MANAGER—MEANING.

The statute absolutely forbids a mine manager to permit any employee while at work to be exposed to any danger found by the mine examiner, unless under his directions, until the dangers are made safe. The principal object of the statute in having the mine examiner to mark and report the dangers to the mine manager is that the mine manager may find them and make them safe. The danger signals also are to prevent other employees from casually going to such danger while in the mine; but as to all employees who will be exposed to the danger while at work or going to and from work, the statute is mandatory and they must not be allowed to enter the mine for work unless under the direction of the mine manager.

Pate v. Gus Blair-Big Muddy Coal Co., 158 Ill. App. 578, p. 583.

Where it is shown that a dangerous condition existed in a mine, it is a violation of the statute to permit anyone to enter the mine to work therein, except under the direction of the mine manager until such conditions have been made safe.

Stanhaus v. Paradise Coal & Coke Co., 169 Ill. App. 75, p. 81.

Under the provision that no one shall be allowed to enter a mine or work therein "except under the direction of the mine manager until all conditions shall have been made safe," where dangerous places have been discovered in a mine and marked and the mine manager has directed experienced rockmen to make such places safe, then anything which brings the conduct of the rockmen reasonably within the control of the mine manager in the performance of the particular duties would be a compliance with the statute. The statute cannot be held to mean that the mine manager must be personally present superintending the work of experienced rockmen or miners at each particular dangerous place.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595, p. 597;

Piazzi v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 33;

Kellyville Coal Co. v. Bruzas, 125 Ill. App. 464;

Tygett v. Sunnyside Coal Co., 140 Ill. App. 77, p. 83.

See Wilson v. Danville Collieries Coal Co., 171 Ill. App. 65, p. 69.

Section 21, clause b, should not be interpreted to mean that the mine operator must be personally present at all times while the conditions are being made safe as that would be impractical. There may be many places in a mine which require repairs and work at the same time to make all conditions safe and the statute can not mean that there must be as many mine managers as there are places which require repair on any given night, but the statute means that the men who enter and work in the mine to change unsafe conditions existing shall do so under the direction of the mine manager.

Paletta v. Illinois Zinc Co., 153 Ill. App. 506, p. 509.

This statute provides that no one shall be allowed to enter a mine to work therein except under the direction of the mine manager, until all conditions shall have been made safe. But the statute cannot receive too strict a construction, and the provision "except under the direction of a mine manager" should receive a liberal construction and one that will render the statute capable of practical enforcement. It cannot be held to mean that the mine manager must be personally present and direct experienced miners specifically as to what they should do and how they should do it in the matter of making a dangerous condition safe. In a large mine with a large number of rooms or entries where dangerous places are discovered, and a mine owner and operator has employed a competent licensed mine manager and competent rockmen, and the mine manager has been informed by the report of the examiner as to the various dangerous conditions and that the proper danger signal has been placed thereon, as required by the statute, and the mine manager determines that the rock gang shall enter the rooms and entries for the purpose of removing or repairing such dangerous conditions and he orders experienced miners to make such place safe, the miners who are so ordered to make the place safe must be held to be working under the direction of the manager, within the meaning the statute, though he is not personally present at each particular dangerous place in person directing the work.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595, p. 597;

Kellyville Coal Co. v. Bruzas, 125, Ill. App. 404;

Tygett v. Sunnyside Coal Co., 140 Ill. App. 77, p. 83;

Wilson v. Danville Collieries Coal Co., 171 Ill. App. 65, p. 69.

The statute does not require that the mine manager must be personally present at all times while conditions are being made safe; but the statute is observed if the men who enter the mine to change unsafe conditions, shall do so under the direction of the mine manager. Where a miner when injured was not in his room to work therein except under the direction of the mine manager and had only been permitted to enter the mine for the purpose of propping up his room under the direction of the mine manager and making it safe, then he cannot recover for an injury. Under such circumstances it is a question of fact for the jury whether the miner when injured had been permitted to enter the mine as a miner mining coal or as a company man and was working under the directions of the mine manager making conditions safe.

Driza v. Jones & Adams Coal Co., 171 Ill. App. 139, p. 144.

The provision in the statute that the operator of a mine may permit a miner to enter the mine to work under the direction of the mine manager even when unsafe conditions exist, means that the manager under such conditions will be vigilant to care for the safety of the men under his charge. But where instructions given by a mine manager to a miner or employee were only intended to make a dangerous place temporarily safe, and where the construction of the roof was such that dangerous changes might occur at almost any time, and the manager gave no further attention to the place or the men, and three days later the dangerous changes having taken place a fall occurred by which a miner was injured the mine operator cannot escape liability as the miner under such circumstances was not engaged at the time of his injury in making a dangerous place safe, where at the time of his injury he was engaged in removing the fall from the track and clearing the entry so cars could pass and had no instructions to make the dangerous place safe other than that originally given him for temporary purposes.

Sellers v. Peabody Coal Co., 173 Ill. App. 220, p. 225.

See Noonan v. Saline County Coal Co., 173 Ill. App. 541.

A mine operator who permits a miner to enter the mine to work therein otherwise than under the direction of the mine manager, knowing of the dangerous condition of the mine and before such dangerous condition has been made safe, is guilty of a conscious violation of section 18 of the statute that renders him liable to an injured miner for a wilful violation of the statute.

Olson v. Kelly Coal Co., 236 Ill. 502, p. 506.

See Odin Coal Co. v. Denman, 185 Ill. 413;

Marquette Third Vein Coal Co. v. Dielle, 208 Ill. 116;

Kellyville Coal Co. v. Strine 217 Ill. 516;

Henrietta Coal Co. v. Martin, 221 Ill. 460;

Eldorado Coal & Coke Co. v. Swan, 227 Ill. 286;

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 41.

A complaint in an action by a miner for damages caused by a fall of rock from the roof of a mine is sufficient where it charges that on the morning of the day the complainant was injured, and before he entered the mine to work, his working place was in a dangerous condition and that the mine operator wilfully permitted, suffered and allowed him to enter his working place to work therein without the directions of or without being under the directions of the mine manager, before such dangerous place was made safe.

Peebles v. O'Gara, 239 Ill. 370, p. 371.

In an action by a miner for damages for injuries caused by a fall from the roof where the mine examiner had placed no mark on the place in the roof alleged to be dangerous, the court is not justified in instructing the jury to the effect that if the plaintiff was engaged in timbering the place in question where he was injured under the direction of the mine manager, then the finding should be in favor of the defendant operator, as the instruction in no way explains or makes clear what should be understood from the words "under the direction of the mine manager," and it cannot be said that the instruction is in the language of the statute.

Wilson v. Danville Collieries Coal Co., 264 Ill. 143, p. 147.

See Mertens v. Southern Coal Co., 235 Ill. 540.

51. DANGEROUS CONDITIONS—CHANGES IN ACT 1911.

In the amendatory act or the revision of 1911 of the general mining act the legislature intended to relieve the mine owner from the duties cast upon him by the provisions of this act by omitting the expression "or other unsafe conditions" and "any other unsafe conditions." Thus a positive requirement was taken out of this act by positive legislative enactment. The effect of this change is to do away with the necessity of the mine examiner to mark or record "any other dangerous conditions" in the mine, and he is now required to mark and report the specific conditions named in the statute.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 159;

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 408.

The revision of the mining laws of 1911 requires the mine examiner to "observe whether there are any recent falls, or dangerous roofs, or accumulations of gas, or dangerous obstructions in rooms or roadways," and mark and report the same; but he is not required to examine or mark "any other dangerous conditions" as was required by the act of 1899 and the amendments of 1907. Specific duties pointed out by this revised act require that after inspection and examination the mine examiner discovers working places in which there are recent falls or dangerous roofs or dangerous obstructions, he must place a conspicuous mark or sign thereat as notice to all men to keep

out and to make a record of the fact in a book kept for that purpose; but he is no longer required to observe and report on dangerous conditions only as the enumeration of these particulars excludes the generals required in the former acts.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 150.
See Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 408.

Section 1 of the act of 1911 makes it the duty of mine examiners to examine the underground workings of a mine within twelve hours preceding every day on which the mine is operated and to inspect all places where men are required to pass or to work, and when working places are discovered in which there are recent falls or dangerous roofs or dangerous obstructions, to place a mark or sign as notice to all men to keep out. This act uses the term "dangerous obstructions," while the act of 1907 used the words "or other unsafe conditions." Dangerous conditions may exist from other causes than obstructions, but an obstruction may make a dangerous condition, and that is the character of obstruction meant by the language used in this act.

Eaton v. Marion County Coal Co., 257 Ill. 567, p. 570;
Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 309.

The words "or other unsafe conditions" and "any other unsafe conditions" which were in the act of 1907 were omitted in the subsequent revisions. It would be unreasonable to suppose that the legislature did not intend to change the operation of the law when these words were omitted. By the new act the mine examiner is not to be thereafter required to inspect and mark places that under the act of 1899 and the amendatory act of 1907 he was required to examine, inspect, and mark. The present requirement is that the mine examiner shall observe whether there are "any recent falls or dangerous roofs or accumulations of gas or dangerous obstructions in rooms or roadways," and it is only when he finds such conditions that he is required to place a conspicuous mark thereon.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 155.

The act of 1911 does not require the inspection and marking of "dangerous conditions" at the face of the coal, as the plain meaning of this amendatory act was to do away with such requirements. In expressly designating the particular places in the mine where inspection and marking should be made there is no doubt as to what was intended by the omission of the words employed in the former act, and the requirement found in the earlier acts to examine and mark dangerous conditions generally has been wholly eliminated from the law by this amendatory act.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 150.

The requirements of the statute for a conspicuous mark and a report relates only to working places and their physical condition and does not include other things, and this comes within the requirements of the constitution.

Cook v. Big Muddy-Carterville Mining Co., 249 Ill. 41, p. 47;
Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 190, p. 204;
Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 310.
See Felchner v. Consolidated Coal Co., 176 Ill. App. 411, p. 413.

52. DUTIES IMPOSED ON MINERS.

The statute makes it unlawful for a miner to enter a mine against caution or to disobey any order given in pursuance to the statute and implies that miners shall obey the rules adopted by a mine operator that are consistent with the statute. But a rule prohibiting a miner under any circumstances from leaving his working place before the hour fixed, and if he does he does

so at his peril, is unreasonable. The statute provides that a miner must be given an opportunity to leave the mine whenever he is prevented from further working, and no rule can be adopted in conflict with this right. The fact that a miner left his room because he was taken sick can not be held a violation of the statute or of any rule adopted by the mine operator.

Junction Mining Co. v. Ench, 111 Ill. App. 346, p. 349.

It is the duty of a miner under the statute to set all props and to place all braces necessary to keep his room in a safe working condition, and it is the duty of the mine operator to furnish such props of sufficient number and length when required or called for by the miner. Where a dangerous place had been properly marked by the mine examiner and the miner directed to set a prop and pursuant thereto the miner did set a prop, but where such prop was knocked or blown down it was the duty of the mine examiner to re-mark the place as dangerous on the morning following a report of same, and a failure to do so resulting in injury to the miner will not relieve a mine operator from liability, although the miner knew the place had been previously marked, the props set and that the prop was knocked or blown down, as any contributory negligence on the part of the miner in this respect would not be a defense.

Mertens v. Southern Coal Co., 235 Ill. 540, p. 548;

Kilduff v. Consolidated Coal Co., 164 Ill. App. 194, p. 198.

53. MINER'S WORKING PLACE—DANGER—RECOVERY FOR INJURY.

A coal miner injured by a fall of coal from the face of the room and by coal of the kind which would be taken down by the miner in the usual course of his work in mining coal, can not recover from the operator as there is no legal liability for an injury so received.

Munier v. Chicago & Carterville Coal Co., 180 Ill. App. 114, p. 118.

Under the revised mining act of 1911 there can be no recovery by a miner for injuries caused by the existence of a dangerous condition at the face of the coal. No duty is imposed upon the mine examiner either to mark or report such dangerous condition.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 160;

See *Glebas v. Spring Valley Coal Co.*, 159 Ill. App. 88.

There can be no recovery under this statute in an action by a miner for damages for injuries received while engaged in making a dangerous condition in his working room safe under the direction of the mine manager, on the alleged ground of a willful violation of the statute. In such case the miner is acting under the direction of the mine manager to make safe the condition of his working place, as his employment at the time of the injury was not that of a miner engaged in digging coal, but as an employee under direction to repair and make safe a dangerous working place; and while so engaged as a repairer, his duty and risks assumed were changed, and he was not then within the protection of the statute, and his injuries were not occasioned by a willful disregard of a statutory duty.

Gallatin Coal & Coke Co. v. Andrewzewski, 137 Ill. App. 1, p. 4;

Andrewzewski v. Gallatin Coal & Coke Co., 143 Ill. App. 418, p. 421;

Cappelin v. Jones & Adams Coal Co., 164 Ill. App. 267, p. 269.

The duty imposed by section 18 upon a mine examiner to observe all unsafe conditions in a mine before men should be permitted to enter it does not relate to the presence of standing powder smoke in a miner's room where such condition did not exist prior to the time the miner entered the mine but occurred subsequent to such time and while the miner was working therein. Neither can

the duty imposed by this statute upon a mine examiner relate to an unsafe condition of the roof causing the injury complained of, where the evidence shows that the unsafe condition of the roof did not exist before the miner entered the mine to work, and could not therefore be observed by the mine examiner, especially where the dangerous condition was caused by shots fired by the miner during the progress of his work in mining coal and at a time when the mine examiner had no opportunity and was not required to examine and report its condition.

Layman v. Penwell Min. Co., 142 Ill. App. 580, p. 586;
Schultz v. Burnwell Coal Co., 180 Ill. App. 693, p. 697.

In the absence of conspicuous marks at his working place, as notice to a miner of the dangerous condition of the roof of the entry and to keep out, he is justified in assuming that his working place has been examined and found to be free from danger, and that he can safely work therein.

Kellyville Coal Co. v. Strine, 217 Ill., 516;
Hollingshead v. Wabash Coal Co., 142 Ill. App. 641, p. 645.

In an action by a miner for damages for injuries caused by an alleged violation of the statute, the fact that the injured miner and those working with him were engaged in enlarging an entry or space to be used for an entry by making it both wider and higher, and were removing a part of the vein of coal left as the roof of such entry, did not change the nature of their duties, but they were simply engaged as miners in mining and loading coal and were paid for their work according to the amount of coal mined as other miners. They made changes in the conditions surrounding them as they proceeded with their work, but they would do this had they been engaged in opening out an ordinary room in a mine. They were not engaged in making a dangerous place safe or removing a dangerous condition as there were no dangerous conditions existing in the entry at the place in question at the time they were set to work. The evidence does not show that the work in which they were engaged was of a more dangerous character than the work of mining coal in other portions of the mine.

Stanhaus v. Paradise Coal & Coke Co., 169 Ill. App. 75, p. 80.

The requirements of this statute as to the inspection to be made by the mine examiner has no application to conditions at the face of the coal where the miner is working and as to coal that he is mining down.

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 410.

The mine examiner discovered and marked a dangerous place in the roof of a miner's room. The mark consisted of a cross at the dangerous place which indicated that a prop should be placed under the roof at the point marked. The miner on the same day in obedience to the mark placed a prop and continued working in the room with safety. On the afternoon of the same day the prop was knocked down by shots fired at the face of the coal. On the following morning the mine examiner discovered the prop down, observed the chalk marks previously made which were still plainly visible and marked on the face of the coal figures showing the date of inspection, which indicated that the mine had been inspected on that morning. The miner thereafter and on the morning of the same day entered his working place, saw the danger mark on the roof and also the figures indicating the inspection on the morning of that day. He began work in clearing away the gob in order to reset the prop and while so engaged was injured by a fall from the roof. Under such circumstances the mine operator can not be charged with a willful failure to comply with the statute on the ground that the mine examiner did not re-mark or re-trace the plainly visible chalk marks on the dangerous place in the roof, where it was the miner's

duty to prop or make safe the dangerous places when marked by the mine examiner.

Kilduff v. Consolidated Coal Co., 255 Ill., 617, p. 619.

A miner in an action for damages for injuries caused by an alleged wilful violation of the statute and who was injured in a part of the mine distant from his working place, brings himself within the statute where he shows that it was a custom in a mine for the men after the coal was loaded to notify the machine man that they were ready to have coal cut or ready for the machine, and that the miner was injured where pursuant to such custom he had gone to notify the machine man that he was ready to have coal cut or ready for the machine.

Souleyret v. O'Gara Coal Co., 161 Ill. App. 60, p. 63.

A miner injured by a fall of slate can not recover damages for injuries under an alleged violation of the statute in that the mine examiner failed to examine and mark the dangerous place in the miner's room, where the evidence shows that the dangerous place did not in fact exist at the time the examination was made and that the piece of slate, the fall of which caused the injury complained of, was loosened and made dangerous by the injured miner himself removing the coal from under the particular piece of slate.

Williams v. Orion Coal Co., 161 Ill. App. 65, p. 67.

See *Brown v. Kelly Coal Co.*, 162 Ill. App. 65, p. 66.

No liability on the part of the mine operator would arise from a dangerous condition where the miner or employee injured thereby was not in his working place.

Eaton v. Marion County Coal Co., 173 Ill. App. 444, p. 448.

See *Cook v. Big Muddy-Carterville Min. Co.*, 249 Ill. 41.

There can be no cause of action under the mining act for injury to an employee where such employee was not employed by the mine operator and where he was at the place at which he received the injury against the mine operator's will and where the place at which he was injured was not a part of the operator's mine and was not subject to the mining law.

Donaldson v. Spring Valley Coal Co., 175 Ill. App. 224, p. 229.

See *Rogers v. St. Louis-Carterville Coal Co.*, 254 Ill. 104.

54. MINER MAKING DANGEROUS PLACE SAFE—RECOVERY FOR INJURY.

The provision of section 18, which prohibits anyone from entering a mine to work until all conditions shall have been made safe, like the rule which requires a master to use reasonable diligence to furnish a reasonably safe place for his employees to work has no application to those whose duty it is to make dangerous places safe. The statute does not require that the mine examiner shall accompany the rockmen and personally direct them in removing dangerous conditions from a mine.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595, p. 601;

Romeo v. Western Coal & Min. Co., 157 Ill. App. 67, p. 70;

Orlean v. Bunsen Coal Co., 171 Ill. App. 175, p. 178.

See *Colorado Coal & Mining Co. v. Lamb*, 6 Colo. App. 255;

Kellyville Coal Co. v. Bruzas, 125 Ill. App. 464;

Tygett v. Sunnyside Coal Co., 140 Ill. App. 77, p. 83;

Eslick v. Illinois Collieries Co., 149 Ill. App. 607, p. 608;

Wilson v. Danville Collieries Coal Co., 171 Ill. App. 65, p. 69.

A miner or employee who entered a mine where the conditions were dangerous under the direction of the mine manager to repair and make safe the conditions

of his working place, of which he was informed, can not recover damages in an action against the mine operator for injuries received while making the dangerous condition safe.

Gallatin Coal & Coke Co. v. Andrewzewski, 137 Ill. App. 1, p. 4;
Cappelin v. Jones & Adams Coal Co., 164 Ill. App. 267, p. 269.

A miner employed as a timberman and whose duty it was to make all dangerous places safe, and who was working at the time of an injury under the direction of the mine manager and was not permitted to enter the mine except under the direction of the mine manager, it was nevertheless the duty of the operator to comply with the other provisions of the statute which required him to make an examination of the roof of the mine and to mark thereon by a conspicuous mark all dangerous conditions and to make entry thereof in the book kept for the purpose of giving such miner and others who were working in the mine information concerning such conditions.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595;
Smith v. Illinois Colliers Co., 155 Ill. App. 148;
Wilson v. Danville Collieries Co., 171 Ill. App. 65, p. 70;
Wilson v. Danville Collieries Co., 184 Ill. App. 180, p. 182;
Orlea v. Bunsen Coal Co., 171 Ill. App. 175.

A mine operator is not liable for the death of an employee and rockman who was killed by a fall of rock from the roof where the mine had been examined and the dangerous places marked, as required by the statute, and the rockman had been directed by the mine manager to enter the mine to repair and make safe such dangerous places and the rockman was killed while performing such work. The statute does not require the personal presence of the mine manager to superintend and direct in person the work of making the dangerous places safe.

Kellyville Coal Co. v. Bruzas, 223 Ill. 595, p. 598;
Piazzl v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 33;
Eslick v. Illinois Colliers Co., 149 Ill. App. 607, p. 608;
Wilson v. Danville Collieries Coal Co., 171 Ill. App. 65, p. 69.
See Kellyville Coal Co. v. Bruzas, 125 Ill. App. 464.

The conditions under which a miner may work at a dangerous place at his own risk are where the owner has complied with the law by having the mine examined, the dangerous place marked by the mine examiner, and the miner sent to that place by the direction of the mine manager to make safe the particular dangerous conditions there existing.

Piazzl v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 35;
Wilson v. Danville Collieries Coal Co., 264 Ill. 143, p. 146.

A miner who, while engaged in mining coal, reported a fall of slate to the mine manager and he thereupon and according to a custom of the mine and at and under a different contract and compensation was directed by the mine manager to assist in taking up the fall and making the dangerous place safe, can not at any time during the process of cleaning up and making the place safe change his status to that of a coal miner and render the mine operator liable for damages for injuries received during the time he was so engaged in assisting to make the dangerous place safe.

Cappelin v. Jones & Adams Coal Co., 164 Ill. App. 267, p. 269.
See Gallatin Coal & Coke Co. v. Andrewzewski, 137 Ill. App. 1, p. 4.

A miner who on reporting to the mine manager a fall from the roof was ordered by the mine manager under a custom of the mine to clean up the slate, under a different contract and for a different compensation. After he had cleaned up the fall and without reporting he proceeded to drill a hole in

the coal for the purpose of placing a shot and while so engaged and while passing through the neck of the room for the purpose of procuring oil for his lamp was injured by a fall of slate. Under such circumstances, the miner was not within the protection of the statute as his relation to the mine operator was not that of a miner engaged in digging coal, but that of an employee under the direction to assist in repairing and making safe a dangerous place.

Cappelin v. Jones & Adams Coal Co., 164 Ill. App. 267, p. 269.

A miner or company-man employed for the purpose of making dangerous places safe and working under the direction of a mine manager in making a dangerous place safe is entitled to receive and be informed of all dangerous places found by the mine examiner; and it is the duty of the mine examiner to mark such dangerous places conspicuously with a chalk mark for the benefit of such person employed to and engaged in making the dangerous places safe, as well as for other persons who might be required to enter the mine.

Smith v. Illinois Collieries Co., 155 Ill. App. 148, p. 151.

See Romeo v. Western Coal & Min. Co., 157 Ill. App. 67, p. 70.

A mine operator may be liable for the death of a company-man employed for the purpose of making dangerous places safe, who was killed while engaged in the work of making a dangerous place safe where the mine manager failed to point out or indicate to the deceased or the persons working with him specifically any dangerous or unsafe places in the room, or where the result of the examination of the mine examiner was not by chalk marks or in any other way communicated to the deceased or the men who were working with him in making the dangerous places safe.

Smith v. Illinois Collieries Co., 155 Ill. App. 148, p. 151.

See Romeo v. Western Coal & Min. Co., 157 Ill. App. 67, p. 70.

A miner employed to make safe the dangerous places in the mine, the conditions of which were obvious and apparent, is chargeable with full notice of such conditions where he has full opportunity and equal means of knowledge with the mine operator to observe such conditions. Under such circumstances the employee is not employed as a miner proper working at mining and if by reason of his employment to make safe such dangerous places he is injured, he can not recover where he was given no special directions by his foreman as to how to do the work but left to his own judgment to make the place safe, as in such undertaking the miner assumes the hazard of employment.

Orlea v. Bunsen Coal Co., 171 Ill. App. 175, p. 178.

See Sellars v. Peabody Coal Co., 173 Ill. App. 220.

It is the duty of timbermen to work in unsafe places and make them safe as required by the statute, whenever and wherever directed by the mine manager. The mine manager is only performing his statutory duty when he sends timbermen to clean up a fall and make the place safe. No order was given which could have possibly changed the relations of the parties, and a mere direction on the part of the mine manager to the timbermen to hurry up with the work and assist in cleaning up the fall would not affect the result. A general order to do work in the usual course of employment does not constitute negligence or impose a liability on the operator.

Kalinski v. Williamson County Coal Co., 263 Ill. 257, p. 263.

Where in an action for damages by a miner injured by a fall from the roof, the mine operator who is defending on the ground that the roof where the fall occurred was a dangerous place and that the miner was engaged at the time of his injury under the direction of the mine manager in making a dangerous place safe, and therefore not within the statute, can not ask a reversal of the judgment

on the ground that the court erroneously permitted expert miners to testify on the trial of the case that the roof was in fact dangerous.

Sellars v. Peabody Coal Co., 173 Ill. App. 220, p. 227.

55. MINER WITHIN SCOPE OF EMPLOYMENT.

In an action by a miner for damages for injuries due to an alleged violation of the statute it must be made to appear by proper averments in the declaration that the complainant was at the time he received the injuries in the discharge of his duties under his employment.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 265.

A flagman in a mine must be regarded as acting within the scope of his employment and in the line of his duty at the time of an injury where he was assisting a driver in managing and driving his mules in hauling coal and where this was made a part of his duties, and where it appears that at the particular time he was assisting the driver under the express directions of the assistant mine manager.

Loftus v. Illinois Midland Coal Co., 181 Ill. App. 197, p. 200;

Loftus v. Illinois Midland Coal Co., 193 Ill. App. 454, p. 456.

Any miner working in a coal mine is a "workman" within the meaning of the statute when he is engaged in performing the character of labor which exposes him to the perils the statute was designed to protect him against.

Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 538, p. 541.

The statute does not require a mine owner to prop or secure the roof in a mine and the security of others than the miner does not seem to have been in view by requiring the supply of props and timbers for that purpose. The liability, where one exists, must be to those for whose benefit the statute was enacted.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 243.

A miner in order to get his pay on pay day had to and was directed to go to the mine manager at the bottom of the mine, and who, in returning to his working place where he had left his tools in accordance with the custom, was killed by an explosion of gas permitted to accumulate in an entry through which he was required to pass, and the accumulation of which gas had not been discovered and reported by the mine examiner. Under such circumstances, the mine operator owed the deceased miner the statutory duty of examining the mine and seeing that it was free from an accumulation of gas.

Romani v. Schoal Creek Coal Co., 191 Ill. App. 521, p. 528.

See *Brunnworth v. Kerens-Donnewald Coal Co.*, 200 Ill. 202, p. 218.

56. SHOT FIRERS—APPLICATION OF STATUTE.

NOTE.—See shot firers' act, p. 376.

The shot-firers' act of 1905 modifies the general act of 1899 relating to mines and miners by prohibiting the work of shot firing by miners in mines where more than 2 pounds of powder is used for a single blast, and in mines where gas is generated in dangerous quantities; but it does not purport to amend any act, and is, in fact, a complete and independent act of the legislature, requiring the employment of shot firers under certain conditions and fixing penalties for any willful neglect, refusal, or failure to do any of the things required by it.

Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, p. 104.

See *Hougland v. Avery Coal Mining Co.*, 246 Ill. 609;

Kulvie v. Bunsen Coal Co., 253 Ill. 386.

At the time of the enactment of the statute of 1879 and of the statute of 1899, the shot firers were not in contemplation and the statute of 1905 providing for shot firers does not bring them within the provision and the protection of these acts.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 242.

The provisions of sections 16 and 20 of the act of 1899, with reference to shot firers apply only where the miners did their own firing and they have no application to shot firers employed and installed under the act of 1905.

Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 19.

The shot-firers' act of 1905 is not an amendment to this general act but is independent legislation and the penalties imposed by section 33 of this act can not be extended to violations of the shot-firers' act.

Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, p. 104.

The act of 1899 prohibiting the work of shot firing by miners, under certain circumstances, is modified by the shot-firers' act of 1905 and the amendatory act of 1907. The original act of 1905 is a complete and independent act requiring the employment of shot firers under certain conditions and fixing penalties for any willful neglect, refusal, or failure to do any of the things required.

Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, p. 104.

See *Houghland v. Avery Coal & Min. Co.*, 246 Ill. 609;

Kulvie v. Bunsen Coal Co., 253 Ill. 386.

The provision of the act of 1899 requiring the instruction of miners as to the manner of placing and discharging blasting shots does not apply to shot-firers under the Shot-Firers' Act of 1907.

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 387.

The failure of a mine operator to deliver props, caps, and timbers to miners on demand as required by this act can not be taken advantage of and does not constitute a cause of action under the statute in favor of a shot-firer, who was injured by reason of the operator's failure to deliver the props to the miners.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 243.

57. COMPLIANCE WITH STATUTE—LIABILITY FOR FAILURE.

A mine operator is not authorized to substitute precautionary measures in lieu of those required by the statute.

Eldorado Coal Co. v. Swan, 227 Ill. 586;

Hollingshead v. Wabash Coal Co., 142 Ill. App. 641, p. 645.

The fact that a shot-firer fired shots in an unskillful manner and by a method forbidden by the statute will not operate to defeat an action for damages for injuries where the explosion of gas producing the injuries could not have reached or extended to the miner if the operator had not failed in performing the statutory duty of keeping the roadway sprinkled or clean, and that the explosion reached the miner and produced the injuries was because it was aggravated and made defective by the fact that the air in the roadway was charged with dust.

Davis v. Illinois Collieries Co., 232 Ill., 284, p. 290.

See *Brunnworth v. Kerens-Donnewald Coal Co.*, 260 Ill. 202, p. 24.

A mine operator is guilty of a willful violation of this section of the statute where he fails to adopt and post rules to govern shot-firing by miners as required by this section. The fact that a miner can not read the English language does not excuse a mine operator from posting the rules or relieve him from liability for failing to do so.

Franci v. Tazewell Coal Co., 157 Ill. App. 477, p. 483.

Where a mine manager had employed a miner to work at the top of a shaft during the night and one of his duties was to deliver a box of tools in the mine, to do which it was necessary to be at the top of the shaft and where the mine operator knew the duties of such person would require his presence at the top landing and at the cage during the night and with such knowledge the mine operator failed to furnish a light as the law requires, such failure is a conscious violation of the statute.

Grimm v. Donk Bros. Coal & Coke Co., 161 Ill. 101, p. 104.

58. WILLFUL VIOLATION OF STATUTE—WHAT CONSTITUTES.

The word "wilful" used in this statute means the intentional doing of the prohibited act or the conscious omission to do the prescribed act, there being present no impelling or restraining force or condition sufficient to overpower the will of the operator upon whom the duty is imposed.

Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 395.

See Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41;

Wilmington & Springfield Coal Co. v. Sloan, 127 Ill. App. 218, p. 220;

Moore v. Centraalia Coal Co., 140 Ill. App. 291, p. 297.

A willful violation by a mine operator of a provision of the statute means a conscious failure to observe it.

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 51;

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 481;

Salerno v. Missouri & Illinois Coal Co., 188 Ill. App. 343, p. 344.

Wendzinski v. Madison Coal Co., ——— Ill. ———, 118 N. E. 435.

A willful violation of the statute is one knowingly and deliberately committed.

Catlett v. Young, 143 Ill. 74;

Donk Bros. Coal, etc., Co. v. Stroff, 100 Ill. App. 576, p. 581;

Brookside Coal Min. Co. v. Dolph, 101 Ill. App. 169, p. 173.

An act consciously omitted is willfully omitted in the meaning of the word "wilful" as used in this statute.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 121;

Fulton v. Wilmington Star Min. Co., 133 Federal 193, p. 196.

A willful violation of the statute is a conscious violation.

Hamilton v. Spring Valley Coal Co., 149 Ill. App. 10, p. 20.

See Eldorado Coal Co. v. Swan, 227 Ill. 586, p. 591.

A conscious omission or failure to comply with the statute renders the operator of a mine liable for ensuing injuries.

Riverton Coal Co. v. Shepherd, 111 Ill. App. 294, p. 300;

Carterville Coal Co. v. Abbott, 181 Ill. 495;

Odin Coal Co. v. Denman, 185 Ill. 415;

Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41;

Donk Bros. Coal & Coke Co. v. Stroff, 200 Ill. 483.

The word "wilful" as used in this statute is synonymous with "knowingly" and the two words are equivalent.

Peebles v. O'Gara, 239 Ill. 370, p. 374;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370 p. 376.

"Wilful" is not used in the statute in the sense of malicious or with evil intent, but an act consciously or knowingly performed or omitted contrary to the statute is a willful violation of the statute.

Marquette Third Vein Coal Co. v. Dielle, 110 Ill. App. 684 p. 688.

The word "willful" used in the statute is not used in the sense that implies a wrongful intent, but a conscious failure to prevent or meet a duty put upon a mine operator by the statute would be a willful violation of the act and the neglect of that duty would be willful negligence.

Springfield Coal Min. Co. v. Gedutis, 127 Ill. App. 327, p. 329.

See Marquette Third Vein Coal Co. v. Dielle, 208 Ill. 116.

Chicago-Coulterville Coal Co. v. Fidelity etc. Co., 130 Fed. 957.

A conscious act or neglect is willful although there is no evil intent, but willfulness implies something more than a mere failure to exercise ordinary care. There is a clear distinction between a negligent omission and a willful failure to act, and willfulness and negligence have always been recognized as the opposites of each other.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41 p. 51.

See Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 481;

Salerno v. Missouri & Illinois Coal Co., 188 Ill. App. 343, p. 344.

Section 33 gives a right of action for any injury occasioned by a willful failure to comply with any of the provisions of this act.

Karkowski v. La Salle County Carbon Coal Co., 248 Ill. 195, p. 197.

Under the established construction given to the word "willful" in the statute the questions of the existence or nonexistence of good faith or the presence or absence of an indication to comply with the statute on the part of a mine operator are not involved.

Aetitus v. Spring Valley Coal Co., 246 Ill. 241;

Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 275.

To knowingly violate this statute, from which an injury results, is in law, if not in morals, the precise equivalent of a willful injury.

Jupiter Coal Mining Co. v. Mercer, 84 Ill. App. 96, p. 102.

Where an owner or operator of a mine so constructs or equips it that he knowingly operates it without conforming to the provisions of the statute, he willfully disregards its provisions and willfully disregards the safety of the miners employed therein.

Fulton v. Wilmington Star Min. Co., 133 Federal 193, p. 196.

This statute gives a right of action for damages to a miner injured where the injury is occasioned by the willful failure to comply with the statute.

Brookside Coal Min. Co. v. Dolph, 101 Ill. App. 169, p. 173.

The right of recovery for a failure to make an examination of a mine as required by the statute must be based upon a willful failure or a willful violation of the statute.

Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567, p. 573.

See Missouri & Illinois Coal Co. v. Schwalb, 77 Ill. App. 593.

To entitle an injured miner to recover for an alleged willful violation of the statute there must be on the part of a mine operator a conscious violation; but this may arise not only from actual knowledge of the dangerous conditions, but also from a knowledge of the facts from which the mine operator ought to know of the dangerous condition.

Souleyret v. O'Gara Coal Co., 161 Ill. App. 60, p. 64.

See Aetitus v. Spring Valley Coal Co., 246 Ill. 32.

The policy of the law forbids that a mine operator may disregard the requirements of the statute and thereafter be excused from the consequences of violation merely because such consequence was not intended.

Moore v. Centralia Coal Co., 140 Ill. App. 201, p. 297.

A mine owner is liable in damages for injuries sustained by a miner on the ground of willful violation of section 10 of the statute, although the mine was in the hands of a receiver and was being operated by him, where the evidence showed that the receiver had consciously failed to observe the provisions of the statute.

Litchfield Min. & Power Co. v. Beamblossom, 138 Ill. App. 122, p. 126.

Section 23 of the revised mining act of 1911 provides that the miner shall examine his working place; but there is nothing in the statute that relieves the mine operator from the duty enjoined upon him by section 29 and that will relieve him of liability for damages occasioned by the willful violation of the act or willful failure to comply with its provisions.

Davis v. Missouri & Illinois Coal Co., 196 Ill. App. 478, p. 485.

An instruction which correctly defines what is meant by a willful disregard of the mining act is not erroneous, but it might have been refused because of containing a general statement of the law without any reference or application to the case.

Carney v. Marquette Third Vein Coal Co., 175 Ill. App. 139, p. 143.

In an action for damages for injuries sustained on the alleged ground that the mine operator was guilty of a violation of the statute an instruction is proper which advises the jury that where an owner, operator, or manager so operates his mine that he knowingly operates it without conforming to the provisions of the mining act, he wilfully disregards the safety of the miners employed therein, in the sense that the word willful is used in the statute.

Donk Bros. Coal, &c., Co. v. Stroff, 200 Ill. 483, p. 489;

Donk Bros. Coal, &c., Co. v. Stroff, 100 Ill. App. 576, affirmed.

The revision of 1911 took away all rights of miners under the former statute to charge wilful negligence as to any other matters than those specifically mentioned. The act of 1911 casts no duty upon mine examiners either to mark or report the conditions at the face of the coal.

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 160.

See *Gliebas v. Spring Valley Coal Co.*, 159 Ill. App. 88.

This statute is more restricted than that of the Indiana statute upon the subject of giving a right of action. The language there is "willful violation" or "wilful failure" to comply with the statutory requirements.

Princeton Coal Min. Co. v. Lawrence, 176 Ind. 409, p. 479.

The prohibition against employing in a mine a boy of 14 is positive, and the statute requires a certain course by which the age should be ascertained. The employment of a boy under 14 without the mine operator availing himself of the statutory means of learning his age is a willful violation of the statute.

Marquette Third Vein Coal Co. v. Dietle, 110 Ill. App. 684, p. 688;

Struthers v. People, 116 Ill. App. 481.

59. WILFUL VIOLATION—GOOD FAITH—EXCUSE.

The owner or operator of a mine can not excuse himself from liability growing out of a willful or a conscious violation of the mines and mining act, in failing to properly examine the mine and mark dangerous places thereon which are known to him, on the ground that the examiner or manager in good faith thought the place was not dangerous. If such a rule obtained, the right of an injured miner to recover would rest upon the opinion of the owner or operator or his vice principal, the examiner or manager, as to whether the

mine was safe or in a dangerous condition. It is the duty of the owner or operator of a mine to have the mine examined and if in a dangerous condition to have the dangerous place designated by the statutory marks, and if the operator fails in either particular, with knowledge of the dangerous condition, he is liable to an employee in the mine who is injured as a result of the willful failure to obey the mandate of the statute. The liability does not rest upon the ground that in good faith or bad faith he thought there was no danger in the mine, but upon the ground that, knowing the facts which made the mine dangerous, he failed to have the statutory marks properly placed in the mine.

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 37;

Noonan v. Saline County Coal Co., 173 Ill. App. 541, p. 546.

See *Wilkerson v. Willis Coal & Min. Co.*, 158 Ill. App. 620, p. 626;

Vaughn v. O'Gara Coal Co., 173 Ill. App. 268, p. 271.

Mere neglect to discover a dangerous condition creates no statutory liability, but it must be a willful failure to observe the statute, and this means a conscious failure. Where a mine is in a dangerous condition and the owner or operator has failed with knowledge of such condition to comply with the statute he may be held liable for resulting injuries and can not excuse himself on the ground that he had the mine examined and in good faith thought it was not dangerous.

Aetitus v. Spring Valley Coal Co., 246 Ill. 232;

Jacobs v. Madison Coal Corp., 165 Ill. App. 444, p. 446;

Piazzi v. Kerens-Donnewald Coal Co., 179 Ill. App. 540, p. 544.

See *Smith v. Illinois Collieries Co.*, 155 Ill. App. 148.

The fact that the method of firing a shot adopted by a miner had a tendency to cause a greater accumulation of gas and smoke at the mouth of his entry does not excuse a mine operator from the performance of his statutory duty with reference to sprinkling or cleaning the roadway or absolve him from liability for an injury resulting from an explosion aggravated by the presence of dust in the mine.

Maplewood Coal Co. v. Gfaham, 134 Ill. App. 277, p. 279.

60. WILLFUL FAILURE OF MINE MANAGER TO OBEY STATUTE—LIABILITY OF OPERATOR.

The willful failure of a mine manager or examiner to observe the provisions of the statute is a willful violation by the operator, though the operator has no accurate knowledge of the delinquency of the manager or examiner. The fact that the operator employed an examiner who had the statutory certificate in no wise relieves him from the duty imposed by the statute.

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 289.

A mine manager, mine examiner, or hoisting engineer is the servant of the mine operator, and it is the duty of the operator to see that such servant performs the requisite duty; and any such mine manager, mine examiner, or hoisting engineer with respect to the performance of the statutory duty is a servant of the operator of the grade of vice principal, and the mine operator is liable for any willful failure or for any willful violation of the provisions of the statute.

Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61, p. 64.

See *Sangamon Coal Co. v. Wiggerhaus*, 122 Ill. 279;

Mt. Olive & Staunton Coal Co. v. Rademacher, 180 Ill. 538;

Donk Bros. Coal & Coke Co. v. Stroff, 200 Ill. 483;

Odin Coal Co. v. Tadlock, 216 Ill. 624;

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Taylor Coal Co. v. Dawes, 220 Ill. 145;

O'Fallon Coal Co. v. Laquet, 89 Ill. App. 13;

Himrod Coal Co. v. Schroath, 91 Ill. App. 234;

Mt. Olive & Staunton Coal Co. v. Herbeck, 92 Ill. App. 441;
Kellyville Coal Co. v. Zahnka, 94 Ill. App. 74;
Himrod Coal Co. v. Adack, 94 Ill. App. 1;
Donk Bros. Coal & Coke Co. v. Stroff, 100 Ill. App. 576;
Wilmington & Springfield Coal Co. v. Sloan, 127 Ill. App. 218, p. 221;
Durkin v. Kingston Coal Co., 171 Pa. 193;
Williams v. Thacker Coal Co., 44 West Va. 599.

The mere fact that an examiner is licensed by the State and that the coal operators are compelled to employ only such examiners as are licensed does not relieve a mine operator from responsibility for his acts of omission, as this would largely defeat the purpose and object of the statute.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 122.

Certain duties of this act are imposed upon the owner or operator of a coal mine, and for willful omission to perform these duties he may be liable in an action for damages. The duties required of a mine manager, boss, superintendent, or other superior servant in charge of the work are held to be the duties of the principal or owner or operator. The duty of the mine manager to supply props is plain, and, though a failure to perform this duty may be due to the neglect or willful disobedience of an employee to whom was delegated the duty, yet the mine operator is nevertheless liable.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 243.

If a mine examiner by a proper examination would have discovered the dangerous condition of a roof, the fall of which caused the injury sued for, his failure to do so constitutes a willful violation of the statute by the mine operator in that regard.

Gallez v. Kelly Coal Co., 151 Ill. App. 178, p. 181;
Mertens v. Southern Coal Co., 235 Ill. 540;
Peebles v. O'Gara Coal Co., 239 Ill. 370.

It is not necessary that a mine examiner have an evil intent in order to make his failure to comply with the statute a willful violation, but a willful violation of the statute, within the meaning of the law, signifies a conscious violation of the statute.

Marquette Third Vein Coal Co. v. Dielle, 208 Ill. 116;
Mertens v. Southern Coal & Min. Co., 235 Ill. 540, p. 547.
 See *Marquette Third Vein Coal Co. v. Dielle*, 110 Ill. App. 684, p. 686.

A mine manager with knowledge for many days that a roadway needed cleaning or sprinkling and failed to have the same cleaned or sprinkled was guilty of a conscious omission to perform a duty and this was a willful failure to obey the statute.

Davis v. Illinois Collieries Co., 232 Ill. 284, 290;
Donk Bros. Coal Co. v. Peton, 192 Ill. 41.
 See *Houglund v. Avery Coal Min. Co.*, 246 Ill. 609, p. 616;
Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 300;
Carterville Coal Co. v. Abbott, 181 Ill. 405.

61. VIOLATION OF STATUTE—PROXIMATE CAUSE OF INJURY.

The proximate cause of an injury is in law the probable cause of such injury.

Loftus v. Illinois Midland Coal Co., 181 Ill. App. 197, p. 200.
 See *Jenkins v. LaSalle County Carbon Coal Co.*, 182 Ill. App. 36, p. 38;
Loftus v. Illinois Midland Coal Co., 193 Ill. App. 454, p. 456.

The proximate cause of an injury is the act or omission which immediately caused, and without which, the injury would not have happened notwithstanding other conditions or omissions concurring therewith.

Carterville Coal Co. v. Cooke, 129 Ill. 152;
Miller v. Kelly Coal Co., 125 Ill. App. 452, p. 454.

The proximate cause of an injury is not necessarily the beginning cause but it must be the efficient cause, one which a court could say as a matter of law that the injury would not have occurred without it.

Salerno v. Missouri & Illinois Coal Co., 188 Ill. App. 343, p. 344.

If a willful violation of the statute on the part of a mine operator occasioned the injury complained of, then it is wholly immaterial whether the consequences of such violation, as it did in fact occur, could have been foreseen or not, nor whether the injury was directly or indirectly caused by such violation. It is sufficient that the alleged violation was willful and that it did in fact occasion the injury.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 124.

See Willis Coal & Min. Co. v. Grizzell, 100 Ill. App. 480.

Before an injured miner can recover under this section he must show that the proximate cause of the injury was the willful violation of the provisions of the statute by the mine operator.

Dobbles v. Electric Coal Co., 158 Ill. App. 337, p. 338;

Loftus v. Illinois Midland Coal Co., 181 Ill. App. 197, p. 200.

See Stanhaus v. Paradise Coal & Coke Co., 169 Ill. App. 75, p. 81.

A willful violation of the statute must be shown to have been the proximate cause of the injury complained of; and on failure to introduce evidence proving or tending to prove this material and necessary element of recovery, the cause is properly taken from the jury.

Odorizzi v. Southern Coal Mining Co., 151 Ill. App. 393, p. 395.

See Odlin Coal Co. v. Denman, 185 Ill. 413;

Schlapp v. McLean County Coal Co., 235 Ill. 630;

Pettinger & Davis Min. Co. v. Gettleman, 126 Ill. App. 549;

Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567.

In order for a willful violation of the statute to give a cause of action to an injured miner or to the next of kin in case of his death, the violation of the statute must have been the proximate cause of the injury.

Paletta v. Illinois Zinc Co., 153 Ill. App. 506, p. 509;

Roach v. Willis Coal Min. Co., 183 Ill. App. 577, p. 578.

The fair preponderance of the evidence must show that the violation of the statute alleged in a declaration was the proximate cause of the complainant's injury and that the dangerous place complained of was the thing that caused the injury.

Williams v. Orion Coal Co., 161 Ill. App. 65, p. 67;

King v. De Camp Coal Min. Co., 161 Ill. App. 203, p. 204;

Kilduff v. Consolidated Coal Co., 164 Ill. App. 194, p. 197;

Stevenson v. Avery Coal & Min. Co., 143 Ill. App. 397, p. 399.

See Loftus v. Illinois Midland Coal Co., 181 Ill. App. 197, p. 200;

Carter v. Sangamon Coal Co., 162 Ill. App. 8;

Sheppard v. Marquette Third Vein Coal Min. Co., 164 Ill. App. 495, p. 504.

The statute provides that for any injury occasioned by the willful violation of the statute a right of action shall accrue for any direct damages sustained, and the word "direct" does not pertain to the cause of the injury but to the effect of it.

Willis Coal & Min. Co. v. Grizzell, 100 Ill. App. 480, p. 483.

See Coal Run Coal Co. v. Jones, 127 Ill. 379;

Illinois Fuel Co. v. Parsons, 38 Ill. App. 182;

Missouri & Illinois Coal Co. v. Schwalb, 77 Ill. App. 593.

The violation of a statute intended for the protection of persons is *prima facie* evidence of negligence and if the violation is likewise the proximate cause of the injury a person of the class intended to be protected is entitled to an action.

Jupiter Coal Min. Co. v. Mercer, 84 Ill. App. 96, p. 102.

A miner in an action for damages for injuries caused by the alleged violation of the statute by the mine operator must prove by a fair preponderance of the evidence that such failure on the part of the mine operator was the proximate cause of the injury complained of.

Wyzard v. Vivien Collieries Co., 184 Ill. App. 199.

In an action for damages for the death of a miner caused by an explosion of gas in a mine it is not improper for a court to instruct a jury that if they find from the evidence that the wilful violation of the operator proximately contributed to the accident and injury as alleged in the plaintiff's complaint then the plaintiff is entitled to recovery. If the gas exploded and caused the miner's death, the wilful violation of the operator to comply with the statute proximately has contributed to and also caused the death of the miner.

Athens Mining Co. v. Carnduff, 221 Ill. 354, p. 360.

It is the purpose of the statute as evidenced by sections 16 and 19 that a current of fresh air should be maintained throughout the mine sufficient for the health and safety of all men and animals employed therein; but there can be no recovery in an action by a miner for injuries on the ground of a wilful failure to comply with the statute unless the alleged wilful failure or violation was the proximate cause of the injury complained of.

Rosan v. Big Muddy Coal & Iron Co., 128 Ill. App. 128, p. 132.

See Carterville-Herrin Coal Co. v. Moake, 128 Ill. App., p. 133;

Pettinger & Davis Min. Co. v. Gettleman, 126 Ill. App. 549;

Halberg v. Citizens Coal Min. Co., 149 Ill. App. 412, p. 415.

The purpose of the statute in requiring cross-cuts is to secure and maintain throughout the mine currents of fresh air sufficient for the health and safety of the men and animals employed therein so that all parts of the mine shall be reasonably free from standing powder, smoke, and deleterious air. But to render a mine operator liable for damages for injuries to a miner for a failure to provide cross-cuts there must be a causal connection between the injury complained of and the alleged wilful failure in duty.

Carterville & Herrin Coal Co. v. Moake, 128 Ill. App. 133, p. 135.

See Rosan v. Big Muddy Coal & Co., 128 Ill. 128, p. 132;

Pettinger & Davis Min. Co. v. Gettleman, 126 Ill. App. 549;

Odorizzi v. Southern Coal Co., 151 Ill. App. 393, p. 395.

The purpose of sections 16 and 19 was to provide a proper sanitary condition of a mine by a system of ventilation whereby there might be forced throughout the mine currents of fresh air sufficient for the health and safety of men and animals employed therein, and the withdrawal therefrom of noxious gases; but the requirements of these sections are not directed solely to the maintenance of proper sanitary conditions and a mine operator may be liable for an injury to a miner proximately caused by wilful violation of the provisions of these sections, although such injury is not directly attributable to the sanitary condition of the mine. If through the wilful failure of a mine operator to comply with the provisions of these sections noxious gases, deleterious air and standing powder smoke are present in the mine in such quantities, and are of such character as to obscure a miner's vision and he suffers an injury by reason of the obscuration of his vision caused by the presence of such gases, air and smoke, the mine operator should not be permitted to escape liability

for such injury upon the ground that the injury was not proximately caused by conditions affecting the sanitation of the mine.

Layman v. Penwell Min. Co., 142 Ill. App. 580, p. 585.

In an action for damages for injuries caused by an alleged wilful violation of the statute if the jury believe from the evidence that the miner would not have been injured but for the failure of the mine operator to make the examination and his failure to indicate the danger by a mark, then they are justified in finding that the miner's injuries were occasioned by the wilful negligence of the operator within the meaning of the statute.

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Mertens v. Southern Coal Co., 235 Ill. 540;

Brown v. Kelly Coal Co., 162 Ill. App. 65, p. 68.

62. VIOLATION OF STATUTE—FAILURE TO SHOW PROXIMATE CAUSE—INSTANCES.

There can be no recovery for the death of a miner caused by an alleged violation of the statute on the part of the mine operator in that the operator required the deceased, who was the hoisting engineer, to be away from the hoisting engine and at the dynamo engine while men were underground, where his absence from the hoisting engine had no causal connection whatever with and was not the proximate cause of his death.

Sheppard v. Marquette Third Vein Coal Min. Co., 164 Ill. App. 495, p. 504.

There can be no recovery for the death of a shot firer where the evidence is not sufficient to show that his death was caused proximately by the failure of the mine operator to properly ventilate a mine.

Snodgrass v. Chicago-Sandoval Coal Co., 183 Ill. App. 442, p. 446.

An action by a miner for damages for injuries caused by a fall of rock from the roof of a mine on the alleged ground that the mine operator had failed to properly ventilate the mine and by reason of such failure there was such an accumulation of powder smoke that the miner could not see and determine the dangerous condition of the roof, can not be sustained where the proof shows that the miner discovered the condition of the rock and the roof by sounding it with his pick and by reason thereof knew that it was dangerous, and he can not be heard to say that he was prevented from having such knowledge by reason of the obscuration of his vision by standing powder smoke. It follows, therefore, that the presence of standing powder smoke in the miner's room was not the proximate cause of his injury, and there was no casual connection between the injury and the presence of powder smoke in the miner's room.

Layman v. Penwell Min. Co., 142 Ill. App. 580, p. 586.

Proof that the space of two and one-half feet between the car and the rib was not a clear space, and that accumulations of dirt or gob had been permitted, whether wilful or otherwise on the part of the mine operator, would not justify a recovery of damages for injuries to a miner where there was no evidence tending to show that the accumulation of dirt or gob caused or contributed in any manner or to any degree to the accident.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 49;

Eton v. Marion County Coal Co., 173 Ill. App. 444, p. 447;

Carterville Coal Co. v. Cooke, 129 Ill. 152;

Miller v. Kelly Coal Co., 125 Ill. App. 452, p. 454.

In an action by a miner against a mine operator for damages for a wilful violation of the statute in that the operator failed to have a cross-cut opening at every 60 feet in the gangway, there can be no recovery where the injuries

complained of were caused by an explosion of powder supposed to have been ignited by another workman either in squibbing the blasting barrel or in opening his powder keg with a pick, as there could be no casual connection between the violation of the statute and the injuries complained of.

Carterville-Herrin Coal Co. v. Moake, 128 Ill. App. 123, p. 134.

In an action by a driver for damages for injuries caused by being caught between his car and a rib in a haulage way while engaged in removing a sprag from the wheels of his car, on the ground of the alleged wilful violation of the statute on the part of the mine operator in that he failed to provide refuge places as required by the statute, there can be no recovery where the alleged violation of the statute was not the proximate cause of the injury, as the injury under the circumstances might have occurred as it did even though refuge places had been provided as required by the statute.

Schlapp v. McLéan County Coal Co., 138 Ill. App. 1, p. 5.

A mine operator is not liable for the death of a trip driver on the ground of a wilful failure on the part of the operator to cause the dangerous place and conditions in a mine to be marked where the alleged dangerous conditions consisted of broken balance wheels of the engine used in the mine, worn friction blocks used to apply to the drums, and defective drums, all used in the operation of a wire rope, several hundred feet in length used in hauling coal across the mine, and where the death of the trip driver occurred several hundred feet from such machinery, as these are parts of machinery and not the dangerous condition in a mine where the mine examiner must observe and mark.

Pate v. Gus Blair-Big Muddy Coal Co., 252 Ill. 198, p. 200;

Distinguishing Dunham v. Black Diamond Coal Co., 239 Ill. 457.

Spring Valley Coal Co. v. Greig, 226 Ill. 511.

See *Felchner v. Consolidated Coal Co.*, 176 Ill. App. 411, p. 413.

A failure to make an examination of a mine required by the statute may be wilful; but if a subsequent examination was made in good faith before the alleged accident and the cause of the accident was not discovered, then a wilful failure to make the examination at an earlier hour when the cause would have been less likely to be discovered can not be a ground of recovery.

Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567, p. 574.

See *Missouri & Illinois Coal Co. v. Schwalb*, 77 Ill. App. 593;

Schultz v. Donnewald Coal Co., 180 Ill. App. 693, p. 697.

VIOLETION OF STATUTE—CONCURRING OR CONTRIBUTORY CAUSE OF INJURY.

Where an injury is the result of a violation of the statute and the negligence of a third person, an inevitable accident, or some inanimate thing, the operator is liable.

Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 215.

See *Cook v. Big Muddy-Carterville Min. Co.*, 249 Ill. 41;

Brunnworth v. Kerens-Donnewald Coal Co., 169 Ill. App. 68.

The alleged negligent act or omission on the part of the operator must be one of the essential causes producing the injury, but it need not be the sole cause, or the last or nearest cause; but if it concurs with another cause acting at the same time and in combination with it causing the injury, it is sufficient to render the operator liable.

Waschow v. Kelly Coal Co., 245 Ill. 516, p. 519.

In an action by a miner for damages for injuries caused by the alleged violation of the statute on the part of the mine operator it is not necessary to a recovery that the violation of the statute charged should be the sole proximate cause of the injury, but it is sufficient if it be a contributing proximate cause.

In such cases the question of proximate cause is always one of fact, and neither the presence nor the absence of proximate cause can ever appear as a matter of law in any case.

Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 20.

A mine operator may be liable for an injury to a miner for failure to comply with the statute, though such failure was not the sole cause, or the last or nearest cause, but it is sufficient if it concurs with another cause acting the same time which in combination with it causes the injury complained of.

Waschow v. Kelly Coal Co., 245 Ill. 516, p. 520.

See *Miller v. Kelly Coal Coal Co.*, 239 Ill. 626;

Darling v. Wood, 168 Ill. App. 272, p. 275.

To entitle an injured miner to recover damages for the alleged violation of the statute it must be shown that such willful violation on the part of the mine owner was one of the essential causes of the injury complained of, and that without the same the injury would not have happened, and that the injury must follow as an unbroken sequence from and on account of such willful violation of the statute by the mine operator and the injury must have resulted from a combination of causes following in a natural and unbroken line from such willful violation.

Davis v. Big Muddy Coal & Iron Co., 173 Ill. App. 162, p. 169.

When an injury proceeds from two causes operating together the party putting in motion one of them is liable the same as though it was the sole cause. The negligent acts or willful omission or violation of the statute must be one of the essential causes producing the injury, but it need not be the sole cause or the last or nearest cause; but it is sufficient if it concurs with the other cause acting at the same time, which in combination with it causes the injury.

Waschow v. Kelly Coal Co., 245 Ill. 516, p. 519;

Darling v. Wood, 168 Ill. App. 272, p. 275;

Davis v. Big Muddy Coal & Iron Co., 173 Ill. App. 162, p. 167.

The dangerous condition which caused an injury complained of resulted from the haulage track being too close to the rib of coal on one side and in permitting gob to accumulate on the other so that a driver in alighting from his car was thrown or fell and was crushed between the rib and the car. Under such circumstances, it can not be claimed that the condition of the entry was not the proximate cause of the driver's injury. If the viciousness of the mule that the driver was required to use, combined with the dangerous situation and condition of the entry, caused the injury, then the mine operator must be held liable. When an injury proceeds from two causes operating together, the operator putting in motion one of them is liable the same as though he was the sole cause.

Waschow v. Kelly Coal Co., 245 Ill. 516, p. 519.

See *Brunnworth v. Kerens-Donnewald Coal Co.*, 260 Ill. 202, p. 214.

Miller v. Kelly Coal Co., 239 Ill. 626.

64. VIOLATION OF STATUTE—PROOF AND PRESUMPTIONS.

To maintain a charge of wilful violation of the statutory duty to furnish props and caps on request, it is not proper to give evidence of previous failures to furnish as many cap pieces as the miners thought were necessary or that miners complained to the mine examiner that they were not being supplied with pieces. Such evidence did not tend to prove either a demand by the miner either at the time of the accident or the failure of the mine operator to comply with the demand that was alleged to have caused the injury, but is

sometimes admissible to prove knowledge, but not to prove misconduct as a basis of a cause of action.

Hackart v. Decatur Coal Co., 243 Ill. 49, p. 52.

See Taylor Coal Co. v. Dawes, 220 Ill. 145.

To establish a wilful violation of the statute involves proof of a conscious violation and any fact that would establish knowledge on the part of an engineer that the cage was being lowered into the mine at an unlawful rate of speed is admissible in evidence, although it involved proof of the conduct of the engineer at times other than the time the miner was injured.

Taylor Coal Co. v. Dawes, 220 Ill. 145, p. 148;

Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 396, affirmed;

Robertson v. Donk Bros. Coal & Coke Co., 238 Ill. 344, p. 348;

Robertson v. Donk Bros. Coal & Coke Co., 143 Ill. App. 391, p. 396, affirmed.

In an action by a miner for damages for injuries occasioned by an alleged violation of the statute on the part of the mine operator it is proper to show the condition of a road way, wall and roof for a distance of 300 feet or more from the principal doorway and that the alleged condition had existed for a period of six months before the accident occurred. The fact that such conditions existed for such a distance back and that they had existed for several months before the injury tends to show that the conduct of the mine operator in maintaining such conditions was wilful.

Emerling v. Spring Valley Coal Co., 140 Ill. App. 97, p. 100;

See Taylor Coal Co. v. Dawes, 220 Ill. 145;

Robertson v. Donk Bros. Coal & Coke Co., 238 Ill. 344.

In an action by a miner for damages for injuries caused by an alleged violation of the statute, the complainant, in order to succeed, must prove the alleged violation by a preponderance of the evidence.

Gliebas v. Spring Valley Coal Co., 159 Ill. App. 88, p. 89.

In an action under this statute for the death of a miner caused by an alleged wilful violation of the statute, where no negligence is averred in the declaration, it is error for the court to instruct the jury that if they believe from a preponderance of the evidence "that if the mine operator was knowingly negligent," he would be liable, where the declaration charged a wilful violation of the statute.

Clark v. O'Gara Coal Co., 140 Ill. App. 207, p. 211.

See Moore v. Centralla Coal Co., 140 Ill. App. 291.

The fact that a cage was descending into a mine at a rate of speed prohibited by this act at the time a miner was injured might afford a presumption that the engineer controlling the engine that lowered and raised the cage had knowledge of the rate of speed at which the cage was descending into the mine; but if that were the only time in the history of the mine when the cage had been allowed by the engineer to descend at a prohibited speed, the presumption that its unlawful rate of descent was known to the engineer and that such excessive speed was not accidental would be weakened. But if the engineer had repeatedly prior to the time of the injury violated the statute by lowering the cage at a prohibited rate, the presumption that he knowingly and therefore wilfully violated the statute would be greatly strengthened.

Taylor Coal Co. v. Dawes, 220 Ill. 145, p. 148;

Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 396, affirmed;

Robertson v. Donk Bros. Coal & Coke Co., 238 Ill. 344, p. 348;

Robertson v. Donk Bros. Coal & Coke Co., 143 Ill. App. 391, p. 396, affirmed.

The statute of Illinois requires a mine operator to have the mine inspected at the close of each day's work, and a mine operator can not be held liable for the

death of a miner that occurred on the morning following such an inspection where there is nothing to show what changes took place between the time of inspection and the time of the accident, except that a shot had been fired for the purpose of bringing down coal.

Madison Coal Corporation v. Stullken, 228 Federal 307, p. 308.

65. VIOLATION OF STATUTE AND NEGLIGENCE—DISTINCTION.

Negligence is no part of, and is not involved in an action for the wilful violation of a statute.

Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 399, p. 404.

An action given by the statute is for a wilful violation of its provisions and requires more than mere negligence. The General Assembly in obedience to the Constitution performed the duty of specifying certain things which must be done to secure the safety in mines and fix a liability for a wilful failure to do them; but it has not declared the liability of a mine operator for mere negligence unmixed with any intention, through proof or properly inferred from the facts, not to do the thing required. In an action for damages for injuries caused by the alleged violation of the statute it is error for a court to give an instruction which removes all distinction between negligence and wilfulness as this is contrary to the plain language of the statute.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41.

There is a wide difference in the evidence required to sustain an action for wilful injury at common law and that which is sufficient to prove liability for wilful violation of a statute. In the one case an evil intent must be shown and it must appear that the injury was purposely inflicted, or what the law holds equivalent of an evil intent, that the act of a mine operator was in such reckless disregard of certain injurious consequences that wilfulness will be imputed. On the other hand when the action is founded upon the wilful violation of the statute it is only necessary to prove that the defendant consciously or knowingly did or omitted what the law requires.

Moore v. Centralia Coal Co., 140 Ill. App. 291, p. 297.

Before a recovery can be had for a wilful violation of the statute there must have been a failure to perform some act required by the statutes and such act must have been knowingly done or the requirements knowingly omitted or the knowledge of the doing of such act or its omission must be chargeable to the mine owner by reason of a failure to use ordinary diligence and caution in the operation of his mine; but the statute does not apply to an ordinary act of negligence under the common law.

Dobbles v. Electric Coal Co., 158 Ill. App. 357, p. 559.

See *Catlett v. Young*, 143 Ill. 74;

Peebles v. O'Gara Coal Co., 239 Ill. 370.

Circumstances and conditions may exist in a mine that would render the mine operator liable in damages in an action by a person injured on the ground of negligence, but would not be sufficient to render the mine operator liable in an action based on a wilful violation of the statute.

Kean v. Jones Bros. Coal & Min. Co., 147 Ill. App. 319, p. 323.

An amendment changing an action for damages for the death of a miner from one for a common-law liability to one for a violation of this statute presents a different cause of action and a different statute of limitation applies.

McCray v. Moweaqua Coal Min. etc. Co., 149 Ill. App. 585, p. 568.

See *Bradley v. Chicago-Virden Coal Co.*, 231 Ill. 622;

Hougland v. Avery Coal Min. Co., 152 Ill. App. 573.

The general assembly, by virtue of the constitution, has performed the duty of specifying certain things which must be done to secure safety in mines and has fixed a liability for a willful failure to do them; but it has not created or declared a liability of a mine operator for mere negligence unmixed with any intention, through proof or proper inferences from the facts, not to do the things required.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 51.

In an action by a miner for damages for injuries caused by the alleged willful violation of the statute or a willful failure to comply with the statute, it is error for the court to submit the case to the jury on an instruction as to negligence, as in such a case there can be no recovery unless there was a willful or conscious failure to comply with the statute.

Swinosynski v. Kelly Coal Co., 146 Ill. App. 120, p. 122.

In an action under this statute for damages for the death of a miner it is necessary to prove that the proximate cause of the death was the willful failure of the mine operator to comply with some of the provisions of the statute, and the absence of contributory negligence and the assumption of risk are unavailing. In an action for common-law negligence it is necessary to prove that the deceased was in the exercise of due care and did not assume the risk as incident to his employment. The two causes of action are radically different.

McCray v. Moweaqua Coal Min. etc. Co., 149 Ill. App. 565, p. 568.

See *Bradley v. Chicago-Virden Coal Co.*, 231 Ill. 622.

Proof of mere negligence will not justify a recovery in an action under the mining act, but the proof must show that there was a willful failure upon the part of the mine operator to perform or omit to perform an act required by the statute.

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 376.

The term willful negligence as applied in an instruction to a jury in an action for a violation of the statute is a misnomer, but it is not error where it appears that it was the intention of the instruction to refer to the willful violation of the statute charged in the declaration.

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 483.

66. NEGLIGENCE OF OPERATOR—STATUTORY AND COMMON-LAW LIABILITY.

The mining statute is intended to impose obligations upon mine owners for the protection of the miner from injuries which are incident to the operation of a mine. A mine owner is not liable by reason of the statutory provisions for any neglect of duty which falls within the ordinary rules of law regarding negligence which are not incident to the operation of his mine.

Dobbles v. Electric Coal Co., 158 Ill. App. 357, p. 358.

See *Girard Coal Co. v. Wiggins*, 52 Ill. App. 69.

An adult competent to contract as a miner and responsible for his own acts should not be permitted to compel a mine operator to respond to him in damages for an injury resulting from a negligent act that required his cooperation and in the performance of which he was equally guilty.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 267.

The violation of a statute imposing a duty is actionable negligence on the principle that the omission of duty otherwise imposed must be for the benefit of the person injured and there must be a causal relation between the act and the injury.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 266.

In an action under the statute by a miner for damages for injuries received by a driver by reason of the low haulage way or entry it is not sufficient to aver that the mine operator could have known of such dangerous condition by complying with the statute; and the mine operator can not be made liable in an action under the statute for negligence without regard to whether the operator had knowledge of the condition or had knowledge of facts from which he ought to have known the dangerous condition, and where the averment eliminates the wilful failure required to create the statutory liability.

Jacobs v. Madison Coal Corp., 165 Ill. App. 444, p. 446;

Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 370, p. 380.

Negligence may be that arising at common law for failure to do or negligently performing things that a reasonably prudent man should do or omit, and it is also a failure to perform a duty commanded by statute, properly denominated negligence per se. There is no distinction made between statutory or common law negligence.

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 486.

The term wilful negligence as applied in an instruction to a jury in an action for a violation of the statute is a misnomer; but it is not error where it appears plain that it was the intention of the instruction to refer to the wilful violation of the statute charged in the declaration.

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 483.

67. EMPLOYMENT OF BOYS—CONSTRUCTION AND PURPOSE OF ACT.

Section 22 of this act is to be construed with the act of 1903 known as the child labor act, and they are to be construed as framed on one system and having one object in view and that is the regulation of child labor in Illinois; and in construing these statutes contemporaneous, antecedent and subsequent statutes on the same subject-matter may be examined and considered.

Struthers v. People, 116 Ill. App. 481, p. 487.

Section 22 prohibiting the employment of children under the prohibited age, like other similar statutes, is intended to guard against the dangers from accidents to the children of the State and to protect the health and general well-being of the children. Such laws are sustainable under the police powers of the State and must be so construed as to accomplish the object sought to be obtained and to correct the evils sought to be removed. Holding the employer of a child in violation of the statute to a strict liability for any injury happening to the child when engaged in such prohibited employment will have a wholesome influence tending to check the evils against which the legislation was directed.

Marquette Third Vein Coal Co. v. Dielle, 110 Ill. App. 684, p. 690.

The statute absolutely forbids the employment of a child under the stipulated age. The reason is that immature children are liable not to understand the significance and importance of the regulations prescribed for a mine and the employees therein and may thoughtlessly disobey orders or expose themselves to peril. An operator who violates the statute cannot screen himself from liability because a child employed in violation of the statute has been injured by reason of the childish traits which give rise to the statute.

Marquette Third Vein Coal Co. v. Dielle, 110 Ill. App. 684, p. 680;

Struthers v. People, 116 Ill. App. 481.

Section 21 of the statute forbids the employment of a child under 14 years of age. A mine operator who employs a child in violation of the statute, places it

in his mine, and exposes it to danger must respond in damages for injuries received by the child on the ground that he willfully violated the prohibition of the statute in that he exposed an immature child to the dangers from which the statute aimed to protect it.

Marquette Third Vein Coal Co. v. Dielle, 110 Ill. App., 684, p. 690;
Struthers v. People, 116 Ill. App. 481.

A person who contrary to the statute employs a child at a prohibited employment is liable for resulting injuries, and neither contributory negligence nor disobedience of orders can be interposed as a defense to an action for damages.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 267.
 See *Purtell v. Philadelphia Coal Co.*, 256 Ill. 110.

This statute makes it unlawful for a mine owner to employ or permit a boy under 14 years of age to perform manual labor in and about a mine, and further provides that before any boy can be permitted to work he must produce to the mine manager or operator an affidavit from the proper person that he is 14 years of age. The object sought to be accomplished by this statute is to prevent the employment of boys of immature years in the coal mines of the State. In case the statute is violated and a boy under the prohibited age is injured while performing manual labor which he is employed or permitted to do in a mine, the statutory liability for damages has occurred, and the questions of willful violation of the statute and the proximate cause of the injury are questions of fact for the jury to determine in an action for damages.

Marquette Third Vein Coal Co. v. Dielle, 208 Ill. 116, p. 122.
 See *Chicago, Wilmington, etc., Coal Co. v. Moran*, 210 Ill. 9.
Marquette Third Vein Coal Co. v. Dielle, 110 Ill. App. 684, p. 686.

68. ACTION BY INJURED MINER—PLEADING AND PROOF—RECOVERY.

A cause of action for damages for injuries to a miner, necessary to be alleged and proved under the Mines and Miners' Act, is a different cause of action from that which must be alleged and proved to recover on a common law liability.

Bradley v. Chicago-Virden Coal Co., 231 Ill. 622, p. 628;
Henderson v. Moweaque Min. etc. Co., 145 Ill. App. 637, p. 642.

It is sufficient to sustain an action for a breach of a statutory duty to prove a violation and a resulting injury unless the statute is a general police regulation designed to protect the public at large.

Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 217;
Brunnworth v. Kerens-Donnewald Coal Co., 169 Ill. App. 68.

In an action by a miner for damages for injuries sustained by reason of the alleged willful failure of a mine operator to comply with the provisions of the statute an allegation to the effect that the complainant was in the exercise of due care for his own safety when he was injured, is not required and has no place in such a declaration.

Henderson v. Moweaqua Coal Min. etc. Co., 145 Ill. App. 637, p. 641;
Carterville Coal Co. v. Abbott, 181 Ill. 495.
Donk Bros. Coal & Coke Co. v. Stroff, 100 Ill. App. 576, p. 581.

An action to recover damages for personal injuries resulting from a willful violation of a provision of the mining statute is a civil suit for damages and is not a criminal or penal action to recover or enforce the penalty for its violation and it is sufficient to entitle a plaintiff to recover that he prove his case by preponderance of the evidence.

Guthrie v. Empire Coal Co., 150 Ill. App. 530, p. 537.

Section 33 makes the willful failure to observe the provisions of the statute a misdemeanor, but in a civil action for damages for injuries caused by a willful violation of the statute the plaintiff is not required to prove such violation by evidence which would convince beyond reasonable doubt.

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 291.

A report and record are required to be made by the mine examiner and there is no reason why these are not admissible in evidence to establish the facts required to be reported by the mine inspector and kept in the office of the operator with reference to any accident resulting in injury to a miner.

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 37.

The report of a mine examiner is not incompetent as evidence in an action for damages by an injured miner for an alleged violation of the statute because it contains more than was required, as this would make it possible for an operator to obviate the effect of the report as evidence by inserting therein some necessary or improper matter.

Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497, p. 502.

A clear distinction exists between the right of an injured miner to recover for injuries caused by a fall from the roof where the miner working under the direction of the mine manager is removing the danger or making the dangerous place safe, and where he was sent to clean up a fall by the direction of the mine manager and was not engaged in and had nothing to do with the making the dangerous place safe.

Noonan v. Saline County Coal Co., 173 Ill. App. 541, p. 546.

See *Kellyville Coal Co. v. Bruzas*, 223 Ill. 595.

A mine operator who permits a miner to enter the mine to work therein otherwise than under the direction of the mine manager, knowing of the dangerous condition of the mine and before such dangerous condition has been made safe, is guilty of a conscious violation of section 18 of the statute that renders him liable to an injured miner for a willful violation of the statute.

Olson v. Kelly Coal Co., 236 Ill. 502, p. 506.

See *Odin Coal Co. v. Denman*, 185 Ill. 413;

Marquette Coal Co. v. Dielle, 208 Ill. 116;

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Henrietta Coal Co. v. Martin, 221 Ill. 460;

Eldorado Coal & Coke Co. v. Swan, 227 Ill. 586;

Aetitus v. Spring Valley Coal Co., 246 Ill. 32, p. 41.

In an action by a miner for damages on the ground of the alleged failure of the mine examiner properly to report a dangerous condition or place in a mine, where the mine operator shows in defense of the action that the mine examiner did examine the mine and report and record in a book for that purpose the result of the examination and that his report showed the place in controversy to be dangerous, the injured miner may in his behalf show that the mine operator had theretofore used an old book; that the mine had been shut down for about a week, and a new book had been procured and the reports made and entered in such new book, but that the complainant had not been informed of the use of such new book, had no knowledge of it, and that the old book was kept in its usual place and that he had seen and consulted it on the morning of the accident.

Eslick v. Illinois Collieries Co., 149 Ill. App. 607, p. 609.

In an action by a miner to recover damages for personal injuries by reason of a willful violation of the statute on the part of the mine operator, it is error to permit the plaintiff to prove that the mine operator had made no report of the accident to the State inspector, as required by the statute, as such fact is not involved in the issue.

Haywood v. Dering Coal Co., 145 Ill. App. 506, p. 510.

In an action for damages by a miner injured by an explosion of gas in a mine, it is not necessary to show the operator's knowledge of the condition resulting from the willful violation of the statute, but it is not harmful to the operator to show that three or four days before the accident the fire boss and mine examiner knew that what was then being done in a certain entry was dangerous to the lives of the miners in that part of the mine.

Athens Mining Co. v. Carnduff, 221 Ill. 354, p. 300.

In an action for damages by a car driver for injuries on the ground of an alleged violation of the statute, in that the mine operator laid and maintained a compressed-air pipe in a dangerous condition and dangerously near the car tracks, there was no proof to show that the location of the pipe so close to the rail was an engineering problem or that any engineering difficulties would have been encountered in locating it at a greater distance.

Alexander v. Donk Bros. Coal & Coke Co., 149 Ill. App. 378, p. 380;
Gruenendahl v. Consolidated Coal Co., 108 Ill. App. 644.

In an action for damages by a miner for injuries caused by being thrown from a motor, due to an alleged violation of the statute in that the mine operator permitted the track to be and remain in a defective condition, the ties to become worn, rotten, and defective, making the track uneven and rough, and by reason of which the motor operated by the complainant was thrown from the track and the complainant injured, it was error for the court to refuse to permit the mine operator to show under what circumstances a tie, alleged to be rotten, and shown by the complainant to have been removed by trackmen, was replaced.

Keller v. Chicago-Wilmington-Vermillion Coal Co., 184 Ill. App. 248, p. 253.

In an action by a miner for damages for injuries caused by the alleged failure of the mine operator to properly ventilate the mine in violation of the statute, the complainant is entitled to recover notwithstanding the bad condition of the air at his working place that was caused by the act of a fellow servant, or by reason of a driver negligently leaving a mine door open, although such acts of the servant and the driver and that such acts were not wilfully caused to be done by the mine operator.

Frey v. Kerens-Donnewald Coal Co., 152 Ill. App. 548, p. 552;
Stevenson v. Avery Coal & Min. Co., 143 Ill. App. 397.
See Hougland v. Avery Coal & Min. Co., 152 Ill. App. 573.

A jury in determining whether the failure of the mine examiner to examine and properly record a dangerous condition in a mine was the cause of the miner's injury complained of, may consider whether the miner read or attempted to read, the record before entering the mine on the day of the injury, and also his ability to read the language in which it was read.

Lolli v. Spring Valley Coal Co., 193 Ill. App. 234, p. 236.

In an action by a miner for damages for injuries caused by an alleged violation of the mining act it is not reversible error for the trial court to refuse to permit the plaintiff while testifying as a witness to be asked in the presence of the jury as to his willingness to submit his whole body to the examination of physicians.

Guthrie v. Empire Coal Co., 150 Ill. App. 530, p. 535.

In an action by a miner for damages for injuries sustained by reason of the alleged wilful violation of the statute on the part of the mine operator, it is

proper to admit in evidence where the proper foundation is laid, x-ray photographs of the part of the body and the bones alleged to be injured.

Haywood v. Dering Coal Co., 145 Ill. App. 506, p. 511.

In a cause of action that has accrued to a miner for the violation of the mining act as amended in 1907, his rights must be determined under the law as it then stood although the action for damages was brought after the act of 1911 had gone into effect.

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 481;

Schultz v. Burnwell Coal Co., 180 Ill. App. 693, p. 699;

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 408.

See Shlinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 338;

Mygatt v. Southern Coal Min. Co., 180 Ill. App. 150, p. 153.

69. ACTION BY INJURED MINER—INSTRUCTIONS BY COURT.

An instruction in an action by a miner for damages for injuries which quotes substantially section 18 of the statute is not error.

Mertens v. Southern Coal & Min. Co., 140 Ill. App. 190, p. 193.

In an action by a coal miner for injuries received because of the failure of the mine owner and operator to comply with the statute, an instruction by the court which in general terms is in the language of the statute as to the duties of the owner and operator is not error, although it may omit the particular omission of duty relied upon for recovery.

Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 538, p. 542;

Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41, p. 44;

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 535.

In an action by a coal miner against a mine operator for damages for injuries received while working in a mine, it is error for the court to instruct the jury to the effect that the statutes require that in case the galleries, roadways, or entries of any mine are so dry that the air becomes charged with dust, the operator of such mine must have such roadway regularly and thoroughly sprayed, sprinkled or cleaned, and it shall be the duty of the inspector to see that all possible precautions are taken against the occurrence of explosions which may be occasioned or aggravated by the presence of dust, and where no application is made of the instruction to the facts proved in the case.

Chicago, Virden Coal Co. v. Rucker, 116 Ill. App. 425, p. 427.

In an action by an injured miner against an operator for damages, the operator cannot complain because the court instructed the jury as to all the duties of a mine examiner where the instruction was substantially in the language of the statute, although the evidence showed a violation of certain of the provisions of one section only.

Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 538;

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 536;

Mertens v. Southern Coal & Min. Co., 235 Ill. 540, p. 557.

In an action against a mine operator for damages for the death of a miner caused by a fall of rock from the roof of the miner's working place, the court instructed the jury to the effect that the fact that the deceased miner, after discovering that the rock in the roof was loose and pressing on another rock in the side of his working place and that neither of the rocks had any support under it, continued to work under and around such rocks until the time of the accident, would not alone defeat a recovery if the jury believed from the evidence that the mine operator willfully failed to deliver props as demanded. This instruction is a correct statement of the law and amounted to no more than telling the jury

that contributory negligence on the part of the deceased miner in working in the dangerous place after knowledge of the danger would not bar a recovery.

Arkley v. Niblack, 272 Ill. 356, p. 361.

70. ACTION FOR DEATH—RIGHT TO SUE—WIDOW OR DEPENDENTS.

The statute of 1890 authorizes but one action for the death of a miner and the widow is one of the parties authorized to bring the action.

Consolidated Coal Co. v. Dombrowski, 106 Ill. App. 641, p. 642.

See Litchfield Coal Co. v. Taylor, 81 Ill. 590;

Consolidated Coal Co. v. Yung, 24 Ill. App. 255;

Brennan v. Chicago & Carterville Coal Co., 147 Ill. App. 263, p. 271;

McFadden v. St. Paul Coal Co., 183 Ill. App. 36, p. 40.

Under the statute of 1890 (sec. 33), where a deceased miner left only a widow she is entitled to the entire amount of recovery.

Beard v. Skeldon, 113 Ill. 584;

Willis Coal Min. Co. v. Grizzell, 198 Ill. 313;

Merlo v. Johnston City-Big Muddy Coal & Min. Co., 258 Ill. 328, p. 345.

See Hochstettler v. Mosier Coal & Min. Co., 8 Ind. App. 442;

Kellyville Coal Co. v. Bruzas, 125 Ill. App. 464, p. 468;

Hart v. Penwell Coal Min. Co., 146 Ill. App. 155, p. 156.

An action for damages for the death of a miner under the statute can only be maintained in the name of the widow, who, if living, is the only person authorized by the act to sue.

McCray v. Moweaqua Coal Min., etc., Co., 149 Ill. App. 565, p. 568.

The statute gives the right of action first to the widow if she survives; second to the lineal heirs or adopted children in case the widow does not survive, and a joinder of the widow and the lineal heirs is improper.

Hart v. Penwell Coal Min. Co., 146 Ill. App. 155, p. 157;

McFadden v. St. Paul Coal Co. 183 Ill. App. 36 p. 40.

The statute of 1890 means that only such of the next of kin as were actually dependent on the deceased for support can sue; but the dependency need not be a legal dependency, nor a brother or sister need not be wholly dependent upon the deceased person.

Willis Coal & Min. Co. v. Grizzell, 198 Ill. 313, p. 315.

See Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 328, p. 332;

McFadden v. St. Paul Coal Co., 263 Ill. 441, p. 445;

Kellyville Coal Co. v. Bruzas, 125 Ill. App. 464, p. 468;

Hoover v. Empire Coal Co., 149 Ill. App. 258, p. 267.

There is no misnomer or variance in the name where an action was brought in the name of the widow for damages for the death of her husband, a miner, caused by an alleged violation of the statute by the mine operator, where the plaintiff, pending the suit, was married to a man with a different name.

Romani v. Schoal Creek Coal Co., 191 Ill. App. 521, p. 524.

A father and mother as lineal heirs are the proper and only persons authorized to bring an action under the Mines Act for the death of an unmarried son.

McFadden v. St. Paul Coal Co., 183 Ill. App. 36, p. 39.

The lineal heirs or lineal consanguinity is that relation which exists among persons where one is descended from the other, as between the son and father or grandfather and so upward in the ascending line and between the father and the son or the grandson so downward in a direct descending line. Under this rule a father is entitled to sue for the death of his son where the son left no child, children, descendants of children or adopted child or children and no mother.

Willis Coal & Min. Co. v. Grizzell, 198 Ill., 313, p. 317;

Willis Coal & Min. Co. v. Grizzell, 100 Ill. App. 480. reversed.

See McFadden v. St. Paul Coal Co., 263 Ill. 441, p. 445.

The statute in force in 1853 (Laws of 1853, p. 97) applied to an employer or employee in mining coal with the same force and effect as in any other situation where duties and obligations arise out of the relations of the parties to each other. But the general assembly also provided a remedy in this act of 1899 applicable only to persons engaged in mining coal, in which the liability of the employer rests upon some different grounds. In the case of a death coming within the provisions of this act in relation to mines, the right of action for the damages was vested in the widow, otherwise in the lineal heirs or adopted children or to other dependent person or persons. It was for the general assembly to decide who should bring the action and how the damages should be distributed, and in either case the right conferred is to recover the whole damage. The mining act authorizes but one action and one recovery for the entire loss and damage occasioned by the death.

McFadden v. St. Paul Coal Co., 263 Ill. 441, p. 443.

See Consolidated Coal Co. v. Maehl, 130 Ill. 551;

Cook v. Big Muddy-Carterville Min. Co., 249 Ill., p. 41.

In an action under the statute of 1899 by a widow for damages for the death of her husband killed while working in a mine, the widow may testify that her deceased husband was at the time of his death her sole support.

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 392.

Section 33 of the act of 1899 expressly names the persons who may sue for injury or for the death of a miner caused by the failure of a mine operator to comply with the statute. The language of the statute does not except non-residents nor preclude them from the right to sue under its provisions. A mother who is a nonresident alien may under this statute maintain an action against a mine owner for the wrongful death of a son.

Kellyville Coal Co. v. Petraytis, 195 Ill. 215, p. 216;

Kellyville Coal Co. v. Petraytis, 95 Ill. App. 635 Aff.;

Maplewood Coal Co., In re, 213 Ill. 283, p. 285.

The right of action given by this statute to a widow for the death of her husband from a willful violation of the act, or a willful failure to comply with any of its provisions is controlled by the general laws governing the limitation of personal actions.

Donk Bros. Coal & Coke Co. v. Sapp, 133 Ill. App. 92, p. 95.

Where a willful violation of the provisions of the statute result in injury to an employee the statute of 1899 gives him an action for the direct damages sustained therefor; and in case of loss of life by reason of such willful violation of the statute a right of action is given to the widow or the lineal heirs or adopted children or to any other dependent person. The statute does not give a right of action to an administrator of the person killed and an administrator cannot maintain an action for damages under this statute.

Hoover v. Empire Coal Co., 149 Ill. App. 258, p. 260.

The statute of 1899 gives a right of action for the wrongful death of a miner to the widow of the person killed, his lineal heirs or adopted children or to any other person or persons who were dependent for support on the person killed; but this does not give a right of recovery to a married sister who at the time of the death was living with her husband in a different county and in no wise depending upon the deceased brother for support.

Willis Coal & Min. Co. v. Grizzell, 198 Ill., 313, p. 315.

See Merlo v. Johnston City-Big Muddy Coal Min. Co., 258 Ill. 328, p. 332;

McFadden v. St. Paul Coal Co., 263 Ill., 441, p. 445;

Kellyville Coal Co. v. Bruzas, 125 Ill., App. 464, p. 468;

Hoover v. Empire Coal Co., 149 Ill., App. 258, p. 267.

In an action for the death of a coal miner the mine operator can not defeat the action by showing that he employed the deceased miner as a shot-firer, where such employment would be in violation of the statute and where the deceased miner held a certificate from the examining board as a coal miner only and not as a shot-firer.

Kulvie v. Bunsen Coal Co., 161 Ill. App. 617, p. 620.

A person authorized by the statute to sue for damages for the death of a miner is authorized to compromise and settle the case and claim.

McFadden v. St. Paul Coal Co., 183 Ill., App. 36, p. 41 (1913).

Section 29 of the act of 1911 gives a right of action to the personal representative of the deceased for the benefit of the widow and next of kin or dependent person, and takes the place of section 33 of the act of 1899 by which a right of action was given to the widow, heirs or dependent persons.

Shinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 341.

An action by a mother for damages for the death of her son caused by falling pipe and material in an incomplete shaft, defeated on the ground that the mining act did not apply to such incomplete shaft, is not a bar to a common law action by the mother for damages for the death of her son on the general ground of negligence.

Swengel v. LaSalle County Carbon Coal Co., 182 Ill. App. 623, p. 630.

71. ACTION FOR DEATH—MEASURE OF DAMAGES—PROOF.

Section 33 of the act of 1899 authorizes a recovery by a son for any direct damages sustained by him on account of the death of his father not exceeding the sum of \$5,000. The measure of damages in such case must be damages sufficient to compensate for the pecuniary loss which a decedent's wife or children or both have sustained in consequence of the death of the husband and father; and this is such a sum only as the deceased would probably have earned by his intellectual and bodily labor at his business, profession or trade during the residue of his probable life, which would have gone for the benefit of his wife and children. In estimating the damages his age, business capacity, ability and disposition to labor, and his habits of living are properly to be considered and also the value of the father's services in the attention to and care and superintendence of his children and family and in the education of his children, of which they are deprived by his death.

O'Fallon Coal & Min. Co. v. Laquet, 198 Ill. 125, p. 127;

O'Fallon Coal & Min. Co. v. Laquet, 89 Ill. App. 13, affirmed.

See Willis Coal & Min. Co. v. Grizzell, 198 Ill. 313.

In an action for damages for the death of a miner a jury may in making the estimate of such damages take into consideration whether or not the deceased left surviving, in addition to the widow, any children.

Beard v. Skeldon, 113 Ill. 584;

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 393.

The mining act of 1899 contemplates a recovery of the entire loss by a widow, if there is one; if none, the right of action is conferred upon the lineal heirs or adopted children; but if there is neither widow, lineal heirs, nor adopted children, then any person dependent for support upon the person killed may maintain an action. If an action is brought by the widow, who is entitled to

a recovery of the whole damages occasioned by the death of the husband, the jury may take into consideration whether the deceased left any children.

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41, p. 51.

See *Consolidated Coal Co. v. Maehl*, 130 Ill. 551.

In an action by a widow for the death of her husband, a shot firer, caused by an explosion in a mine, due to the alleged violation of the statute in failing to properly ventilate the mine and in permitting an accumulation of dangerous gas, the testimony as to damages should be limited to the earning of the husband; the age, habits, and condition of his health, and whether the wife was supported by him. But evidence that the wife and children were dependent upon the deceased for support before and at the time of his death, and that he was their sole means of support, is competent.

Conover v. Harrisburg & Southern Coal Co., 161 Ill. App. 74, p. 79.

See *Brennen v. Chicago & Carterville Coal Co.*, 241 Ill. 610;

Kulvie v. Bunsen Coal Co., 161 Ill. App. 617, p. 622;

Cook v. Big Muddy Carterville Min. Co., 249 Ill. 41.

An action under the statute for the death of a miner is not to recover a penalty but is to recover the damages for the death of a miner caused by the violation of the statute.

Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567, p. 573.

See *Missouri & Illinois Coal Co. v. Schwalb*, 77 Ill. App. 593.

Before a recovery of damages can be had in an action for the death of a miner due to the alleged violation of the statute the proof must show that the alleged violation of the Statute was willful and that the death complained of resulted from such failure.

Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567, p. 573.

See *Missouri & Illinois Coal Co. v. Schwalb*, 77 Ill. App. 593.

72. ACTION FOR DEATH—PROOF OF DEPENDENCE.

In an action for wrongful death it is proper to show that a wife, children, or next of kin were dependent upon the deceased for support before and at the time of his death, and such damages may be recovered as are a fair and just compensation for the pecuniary injury resulting from the death to the wife and next of kin of the deceased person. It can not be said in such an action that proof that the wife or next of kin of the deceased were, at and before the time of his decease, dependent upon him for support or that he was the sole support. It is proper to admit evidence of the resources of a widow or next of kin or their financial condition and it is not error to allow questions concerning the earnings of the deceased and whether the wife and children were supported by him.

Brennen v. Chicago & Carterville Coal Co., 241 Ill. 610, p. 620;

See *McCarthy v. Spring Valley Coal Co.*, 232 Ill. 473;

Conover v. Harrisburg & Southern Coal Co., 161 Ill. App. 74, p. 79.

The statute of 1890 provides that a right of action shall accrue to the widow of the person killed under certain circumstances for the recovery of damages for the injuries sustained by reason of such death. It can not be held that pecuniary injury sustained would be the same for all widows regardless of the question of support or receipt of pecuniary aid from the deceased husband in his lifetime or that it is sufficient to prove that a plaintiff is the widow of the deceased and that the entire measure of damages must depend upon the earning capacity of the deceased, leaving out of the question the fact that he did or did not contribute any of his earnings to the support of the widow. To

give meaning to the statute and to show the actual pecuniary loss sustained by the widow, it is necessary to show in an action by a widow for the death of her husband whether she did in fact receive any support or pecuniary aid or had reason to believe that she would thereafter receive such. A widow would, in any event, be entitled to nominal damages in a proper case, but the amount of actual damages must necessarily depend on the real, actual pecuniary injury to or caused by the death, and such damages can not be fully determined without ascertaining the amount of pecuniary assistance, by support or otherwise, she had actually been deprived of by the death of her husband.

Brennan v. Chicago & Carterville Coal Co., 147 Ill. App. 263, p. 271.

In an action by a widow for damages for the death of her husband, a miner, whose death was caused by an alleged violation of the statute, it is proper to show that the deceased left a widow, the plaintiff, and children surviving.

Beard v. Skeldon, 113 Ill. 584;

Kulvie v. Bunsen Coal Co., 161 Ill. App. 617, p. 620.

In an action by a widow against a coal mine operator for damages for the death of her husband, caused by a violation of the statute, it is not error to admit proof that the deceased husband supported his family with wages and that he was a good provider.

Brennan v. Chicago & Carterville Coal Co., 147 Ill. App. 263, p. 273.

The statute makes the pecuniary loss of the widow and the next of kin the sole measure of damages. Where the next of kin are collateral kindred and have not been receiving pecuniary assistance from the deceased and are not in a situation to require such aid, it is immaterial how near the relationship may be, as only nominal damages may be assessed.

Romeo v. Western Coal & Min. Co., 157 Ill. App. 67, p. 71;

Peabody Coal Co. v. Industrial Board, etc., ——— Ill. ———, 117 N. E. 983.

73. ACTION FOR DEATH—PARTIES—CHANGE IN STATUTE.

The amendatory act of 1911 (sec. 29) now gives the right of action to the personal representative of a deceased miner for the exclusive benefit of the widow and next of kin and also to any other person or persons dependent for support on the deceased.

McFadden v. St. Paul Coal Co., 183 Ill. App. 36, p. 40.

See *Wells v. Lumaghi Coal Co.*, 183 Ill. App. 404, p. 408.

Under section 33, act of 1899, a right of action accrued to the widow of a person killed by reason of a willful violation of the statute or to his lineal heirs or adopted children, or to any other person or persons dependent for support upon the person killed, the right to recover for any sum not exceeding \$10,000. Section 29 of the act of 1911 gives a right of action to the personal representative of a person killed by reason of a willful violation of that act for the exclusive benefit of the widow and next of kin and to any other person or persons dependent for support on the person killed for a like recovery, with a proviso that the amount recovered should be distributed to the widow, next of kin, as personal property of intestates is distributed.

Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 323, p. 344.

See *Mengelkamp v. Consolidated Coal Co.*, 259 Ill. 305, p. 313.

Section 33 of the act of 1899 provided that in case of loss of life by reason of a willful violation of the statute a right of action accrues to the widow of the deceased, his lineal heirs or adopted children or other dependent persons. Section 29 of the act of 1911 gives a right of action to the personal representative of the deceased for the exclusive benefit of the widow and next

of kin or to dependent persons and provides for distribution of the recovery. The rights of beneficiaries under the old and the new act are the same.

Shinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 340.

There are two important differences between section 29 and the act of 1911 and section 33 of the act of 1899 with respect to the right of action for the death of a minor caused by the willful violation of the statute. Under the act of 1911 the suit is to be in the name of the personal representative, whereas under the old law it was in the name of the widow. A recovery under the old law was for the exclusive benefit of the widow, lineal heirs, adopted children, and dependent persons, while under the act of 1911 the recovery is for the benefit of the widow, next of kin, and dependent persons. The substitution of the personal representative for the widow as plaintiff is a mere matter of procedure and does not affect the substantial rights of the parties.

Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 328, p. 345.

See *Hochstettler v. Mosier Coal & Min. Co.*, 8 Ind. App. 442.

An action for damages for the death of a miner brought after the act of 1911 became effective and which accrued before the passage of the act must be brought by the personal representatives as provided in that act and not in the name of the next of kin as provided in the act of 1899.

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 409.

See *Roach v. Willis Coal & Min. Co.*, 183 Ill. App. 577, p. 578.

A cause of action accruing to an administrator by virtue of the "Injuries act" to recover damages for the benefit of the widow or next of kin of the intestate is separate, distinct, and different from the cause of action accruing by virtue of the act of 1899 to the widow, lineal heirs, adopted children, or other person or persons dependent for support upon the deceased for the recovery of damages.

Chicago-Virden Coal Co. v. Bradley, 134 Ill. App. 234, p. 238.

The act of 1899 was not so far repealed by the act of 1911 as to deprive a miner of a right of action that had accrued under that act.

Shinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 340.

See *Merlo v. Johnston City & Big Muddy Coal & Min. Co.*, 258 Ill. 328.

The act of 1907 is legislation independent of the general act of 1899 relating to mines and miners, and a violation of this act resulting in the death of a miner does not give to the widow of a deceased miner the right of action to recover damages for the husband's death as did section 33 of the general law of 1899.

Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, p. 106.

Houglund v. Avery Coal & Mining Co., 246 Ill. 615.

The personal representative should be made plaintiff in a suit under the act of 1911 for a death occurring before that act was passed; but if erroneously commenced in any other name the defect can be cured in the trial court by amendment. Where a suit was brought by the proper plaintiff under the act of 1899 a final judgment rendered in the trial court before the act of 1911 took effect, and the case was appealed after the act of 1911 took effect, an amendment by substituting the proper plaintiff could be made either in the appellate or in the Supreme Court.

Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 328, p. 345.

See *Hochstettler v. Mosier Coal & Min. Co.*, 8 Ind. App. 442;

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 313;

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 409.

74. ACTION FOR DEATH—LIMITATION.

Section 33 of the amendatory act of 1907 limits the time within which a widow of a coal miner can sue for the death of her husband caused by the alleged violation of the mining statute to one year. There is nothing in the act to indicate that a retroactive effect was intended or that the amendment should apply to a cause of action which arose before the amendment took place; and the amendment does not bar a cause of action that had accrued under the act of 1905 prior to the enactment of this statute.

Gruber v. LaSalle County Carbon Coal Co., 150 Ill. App. 427, p. 429.

Where a cause of action was brought under the provisions of the act of 1899 for damages for the death of a miner and the declaration was amended and changed to a cause of action accruing under the "Injuries act," the amendment is barred by the statute of limitations, if at that time the cause of action under the "Injuries act" would be barred.

Chicago-Virden Coal Co. v. Bradley, 134 Ill. App. 234, p. 239.

The statute in force in 1906 concerning coal mines contained no limitation of time within which a suit could be brought to recover damages for the death of a miner, and the only limitation upon such actions is that in the general chapter on limitations on actions, and this chapter limits the bringing of all civil actions not otherwise provided for to five years.

Gruber v. LaSalle County Carbon Coal Co., 150 Ill. App. 427, p. 428.

In an action by a widow for damages for the death of her husband, a miner, caused by the alleged violation of the statute by the mine operator, the defendant, by filing the general issue, waived any alleged error of the court in sustaining a demurrer to a plea of the statute of limitations.

Romani v. Schoal Creek Coal Co., 191 Ill. App. 521, p. 524.

75. CAUSE OF ACTION SAVED.

All undetermined claims arising under the statute of 1899, whether suit had been commenced or not prior to July 1, 1911, are saved by the general saving statute (Hurd., R. S., chap. 131, sec. 2; Jones & Addington, sec. 1110b); and the provisions of this statute, so far as they concern the cause of action, continue until the case is disposed of.

Shinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 341.

An action by a miner for damages for injuries caused by a willful violation of the mining act pending at the time of the death of the plaintiff survives his death, and the prosecution of the case may be continued in the name of the widow.

Clark v. O'Gara Coal Co., 140 Ill. App. 207, p. 209.

Undetermined claims for damages for injuries to a coal miner arising under the act of 1899, whether suit has been commenced or not prior to the time the act of 1911 took effect, are saved, and the provisions of the old statutes, so far as they concern the cause of action, continue until the case is disposed of.

Shinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 341.

The act of 1899 was in the main covered by the subjects included in the act of 1911 in relation to coal mines, and was repealed by the latter act without any saving clause. But where a right of action had accrued under the mining act of 1899, or the amendatory act of 1907, before the passage of the repealing act,

the injured miner was entitled to avail himself of the provisions of the act in force when he was injured as to the duties owed to him by the mine operator.

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 481;

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 153.

See Schultz v. Burnwell Coal Co., 180 Ill. App. 693, p. 699;

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 408;

Shinners v. Royal Coal & Min. Co., 188 Ill. App. 335, p. 338.

The act of 1911 was intended in the main to cover the subjects included in the mining act of 1899 and the amendatory act of 1907, and repealed the former act without any saving clause as to accrued rights. But where a right of action had accrued to a miner for damages for a violation of the statute before the passage of this act he was entitled in an action subsequently brought to avail himself of the provisions of the act in force at the time of his injury as to the duties owed to him by the mine operator.

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476, p. 483.

The statute of 1911 does not so far repeal the miners' act of 1899 as to affect the legal status of a cause of action arising under such former act.

Shinners v. Royal Coal & Min. Co., 188. App. 335, p. 340.

The act does not repeal the act of 1897 to the extent of taking from a miner a right of action accruing under that statute, although this revision is a general repeal of all former mining acts; but the right of action is preserved to the injured miner under the general statute saving causes of action that accrued under any former statute.

Schultz v. Burnwell Coal Co., 180 Ill. App. 693, p. 699;

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 409;

Roach v. Willis Coal Min. Co., 183 Ill. App. 587, p. 588.

Substantially all the subjects covered by the act of 1899 are reenacted in the amending act of 1911, and under the general saving statute all undetermined claims arising under this act, whether suit had been commenced or not prior to July 1, 1911, are saved, and the provisions in sections 18 and 19 of this act, so far as they concern the cause of action, can be regarded as continued in sections 14 and 21 of the act of 1911 until such action is finally disposed of.

Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 328, p. 344.

See Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 307;

Wells v. Lumaghi Coal Co., 183 Ill. App. 404, p. 409.

Sections 14 and 21 of the act of 1911 substantially continue the provisions of sections 18 and 19 of the act of 1899 as to any claim or right of action for damages accruing under the act of 1899 and continue such right until the cause is finally disposed of.

Merlo v. Johnston City & Big Muddy Coal Min. Co., 258 Ill. 328, p. 345;

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305.

The act of 1911 does not take away the right of a miner or a car driver in a mine to maintain an action under section 18 of the amendatory act of 1907 for damages for injuries caused by the willful failure of a mine operator to comply with that act in permitting an accumulation of gob in the haulage way which constituted a dangerous condition within the meaning of that act.

Eaton v. Marion County Coal Co., 257 Ill. 567, p. 570.

The right of a miner under section 18 of the act of 1907, which is amendatory of the act of 1899, to recover for injuries caused by a willful failure of the mine operator to mark a dangerous condition and in permitting an obstruction in the haulage way to remain so close to the track as to make the place of work dangerous, was not taken away or affected by the act of 1911.

Eaton v. Marion County Coal Co., 257 Ill. 567, p. 571;

Mengelkamp v. Consolidated Coal Co., 259 Ill. 305, p. 307.

76. CONTRIBUTORY NEGLIGENCE—DEFENSE ABROGATED.

In an action by a miner for damages for injuries caused by an alleged willful violation of the statute on the part of the mine operator, the contributory negligence of the injured miner is not available to the operator as a defense.

Carterville Coal Co. v. Abbott, 181 Ill. 495;
Kellyville Coal Co. v. Strine, 217 Ill. 516;
Henrietta Coal Co. v. Martin, 221 Ill. 470;
Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 215;
Donk Bros. Coal & Coke Co. v. Stroff, 100 Ill. App. 576, p. 581;
Marquette Third Vein Coal Co. v. Allison, 132 Ill. App. 221, p. 232;
Maplewood Coal Co. v. Graham, 134 Ill. App. 277, p. 279;
Guthrie v. Empire Coal Co., 142 Ill. App. 332, p. 335;
Karkowski v. La Salle County Carbon Coal Co., 154 Ill. App. 390, p. 405;
Elam v. Majestic Coal & Coke Co., 155 Ill. App. 375;
Franci v. Tazewell Coal Co., 157 Ill. App. 477, p. 481;
Fuchs v. Consolidated Coal Co., 157 Ill. App. 41, p. 45;
Wilkerson v. Willis Coal & Min. Co., 158 Ill. App. 620, p. 626.
See Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41;
Brunnworth v. Kerens-Donnewald Coal Co., 169 Ill. App. 58;
Chicago-Coulterville Coal Co. v. Fidelity etc. Co., 130 Fed. 957.

The law of 1899 was intended to create a civil liability to which contributory negligence, upon the part of the injured miner, would not be a defense.

Fulton v. Wilmington Star Min. Co., 133 Federal 196, p. 196;
Carterville Coal Co. v. Abbott, 181 Ill., 496.

Contributory negligence on the part of a miner while at work in a mine will not defeat a right of recovery where he was injured by a willful disregard of the provisions of the statute, either by an act of omission or commission on the part of the owner, operator or manager of the mine.

Spring Valley Coal Co. v. Patting, 210 Ill. 342;
Mertens v. Southern Coal & Min. Co., 235 Ill. 545, p. 546;
Tomasi v. Donk Bros. Coal & Coke Co., 257 Ill. 70, p. 74;
Piazzi v. Kerens-Donnewald Coal Co., 262 Ill. 30, p. 35;
Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 487.
See Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 394.

In construing the mining statutes courts have held that mere contributory negligence on the part of a miner will not defeat an action to recover for injuries caused by the willful disregard of the statute either by an act of omission or commission on the part of the owner, operator or manager.

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 523.
See Kellyville Coal Co. v. Strine, 117 Ill. App. 115.

Where a coal mine owner, operator or manager wilfully disregards a duty enjoined on him by legislation, he cannot say that because a miner or an employee enters the mine as a miner with knowledge that the owner or operator has failed to comply with his duty, he is guilty of contributory negligence.

Kellyville Coal Co. v. Strine, 217 Ill. 516, p. 526;
Pawnee Coal Co. v. Royce, 184 Ill. 402;
Odin Coal Co. v. Denman, 185 Ill. 413;
Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333;
Spring Valley Coal Co. v. Rowatt, 196 Ill. 156;
O'Fallon Coal & Mining Co. v. Laquet, 198 Ill. 125;
Willis Coal & Mining Co. v. Grizzell, 198 Ill. 313;
Donk Bros. Coal Co. v. Stroff, 200 Ill. 483;
Riverton Coal Co. v. Shepherd, 207 Ill. 393;
Marquette Third Vein Coal Co. v. Diele, 208 Ill. 116;
Peebles v. O'Gara Coal Co., 239 Ill. 370, p. 373;

Kirchener v. Schoal Creek Coal Co., 162 Ill. App. 52, p. 54;
 Kilduff v. Consolidated Coal Co., 164 Ill. App. 104, p. 197.
 See Henrietta Coal Co. v. Martin, 221 Ill. 460;
 Eldorado Coal Co. v. Swan, 227 Ill. 586;
 Davis v. Illinois Collieries Co., 232 Ill. 284;
 Olson v. Kelly Coal Co., 236 Ill. 502;
 Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 212.

In an action for damages for the death of a miner caused by the alleged wilful violation of the statute, no conduct of the deceased miner short of wilful seeking the very injury that caused his death can have the effect of barring a recovery where the operator's wilful conduct brought about the injury.

Donk Bros. Coal & Coke Co. v. Stroff, 100 Ill. 576, p. 582.

In an action for damages for injuries or death caused by the wilful violation of, or the wilful failure to comply with the positive requirements of the statute, it is no defense to show that the person injured or killed by reason of such violation or failure, was himself negligent and thereby contributed to such injury or death or that he continued in the service and assumed the risk of the increased hazards.

Himrod Coal Co. v. Adack, 94 Ill. App. 1, p. 4;
 Consolidated Coal Co. v. Bokamp, 181 Ill. App. 9.
 See Carterville Coal Co. v. Abbott, 181 Ill. App. 495, p. 498.

In any action by a miner for injuries received because of the alleged failure of the mine operator to comply with the statute the question of contributory negligence on the part of the miner does not arise as it constitutes no defense in such an action and the miner does not assume the risk due to the operator's failure to comply with the statute or to exercise reasonable care and prudence.

Riverton Coal Co. v. Shepherd, 111 Ill. App. 294, p. 302;
 Spring Valley Coal Co. v. Rowatt, 196 Ill. 156.
 Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 20.
 See McCarthy v. Spring Valley Coal Co., 149 Ill. App. 275, p. 279;
 Himrod Coal Co. v. Clark, 197 Ill. 514.

A shot-firer is within the protection of this act and his contributory negligence will not defeat a recovery.

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 200;
 Brennen v. Chicago & Carterville Coal Co., 241 Ill. 610, p. 618;
 Houghland v. Avery Coal Min. Co., 246 Ill. 609, p. 615;
 Stevenson v. Avery Coal & Min. Co., 143 Ill. App. 397, p. 399.

The contributory negligence of a shot-firer or of a miner who prepared the shot is no defense to an action for damages under the general mining statute for the death of a miner caused by a wilful violation of the statute.

Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 20;
 Stevenson v. Avery Coal & Min. Co., 152 Ill. App. 565, p. 571;
 Houghland v. Avery Coal & Min. Co., 152 Ill. App. 573;
 Roach v. Willis Coal Min. Co., 183 Ill. App. 577, p. 578.

A coal mine operator is liable on proof of a wilful violation of the miners' act for all injuries caused thereby to an injured miner notwithstanding the fact that the acts of the latter may have aggravated the injuries or rendered him more susceptible to receiving the same.

Frey v. Kerens-Donnewald Coal Co., 152 Ill. App. 548, p. 550;
 See Kellyville Coal Co. v. Strine, 217 Ill. 516;
 Riverton Coal Co. v. Shepherd, 111 Ill. App. 294;
 Guthrie v. Empire Coal Co., 150 Ill. App. 530.

In an action for damages under the statute by a miner injured by reason of the operator's violation of the statute it is necessary to prove that the cause of the accident was wilful on the part of the mine operator, but it is not neces-

sary to allege or prove that the injured miner had exercised due care or was not guilty of contributory negligence.

Litchfield Coal Co. v. Taylor, 81 Ill. 590;
Kellyville Coal Co. v. Strine, 247 Ill. 516;
Bradley v. Chicago-Virden Coal Co., 231 Ill. 622, p. 627.

A mine operator can not excuse wilful failure on his part to furnish suitable props and cap pieces to a miner upon his request, to make his room safe as required by the statute, by saying that the miner was guilty of negligence that contributed to his injury and death.

Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333;
Wojtylak v. Kansas & Texas Coal Co., 188 Mo. 260, p. 297.

When a wilful neglect or omission to discharge a statutory duty on the part of a mine operator is alleged and proved, then contributory negligence on the part of the person injured in consequence of such neglect does not constitute a defense. This doctrine applies in a case where a miner knowing of the dangerous condition of the roof of the mine, took his seat under such dangerous point while sharpening a tool when there appeared to be no reason why he should have sat in that dangerous place.

Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333;
Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333;
See Carterville Coal Co. v. Abbott, 181 Ill. 495;
Odin Coal Co. v. Denman, 185 Ill. 413;
Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 125.

The fact that the negligent want of exercise of due care on the part of a shot firer contributed to his injury, is not available to the operator in an action by the shot firer for damages for such injuries, where it appears that the cause of the injury was in the failure of the operator to comply with the statute in sprinkling or cleaning a dusty roadway.

Davis v. Illinois Collieries Co., 232 Ill. 284, p. 200;
Brennan v. Chicago & Carterville Coal Co., 241 Ill. 610, p. 618;
Houglund v. Avery Coal Min. Co., 246 Ill. 609, p. 616.

Where a mine examiner failed to properly mark the dangerous place in the roof and to indicate its condition in his record and failed to report its condition to the mine manager, and where a miner with knowledge of the defective condition of the roof proceeded to work in the room and was injured by a fall of rock from such dangerous place, the mine operator, in an action by the injured miner for damages can not be heard to say that the failure of the mine examiner to mark the dangerous place was not the proximate cause of the injury and that the act of the miner working in the dangerous place with knowledge of the danger was the proximate cause. If such a theory should prevail then the rule that the defense of contributory negligence can not be interposed in actions of this character would be rendered ineffective. The miner has the right to presume that the absence of the mark indicated an examination on the morning by the mine examiner and the opinion by him that the rock was not dangerous. If the examiner had placed the required mark upon the roof to indicate the danger, the miner would not have gone under the roof in the course of his work.

Mertens v. Southern Coal & Min. Co., 235 Ill. 540, p. 548;
Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 212.
See Wilson v. Danville Collieries Coal Co., 264 Ill. 143, p. 147;
Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 484;
Henrietta Coal Co. v. Martin, 221 Ill. 460, p. 468.

The fact that a coal miner on entering his working place in a mine discovered a dangerous place in the roof and proceeded with his work in picking down the coal, cannot be interposed as a defense in an action by the miner for damages

for injuries caused by the fall of rock from such dangerous place, as under the statute negligence by the injured miner is no defense to an action based upon the mine owner's wilful failure to carry out the provisions of the statute.

Peebles v. O'Gara Coal Co., 239 Ill. 370, p. 373;
Waschow v. Kelly Coal Co., 245 Ill. 516, p. 521.
 See *Kellyville Coal Co. v. Strine*, 217 Ill. 576;
Henrietta Coal Co. v. Martin, 221 Ill. 460;
Eldorado Coal Co. v. Swan, 229 Ill. 586;
Davis v. Illinois Collieries Co., 232 Ill. 284;
Mertens v. Southern Coal Co., 235 Ill. 540;
Olson v. Kelly Coal Co., 236 Ill. 502;
Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 212.

The fact that a miner was attempting to ride in a car against the rules of a mine operator cannot be considered as a defense in an action for damages for the death of the miner caused by an alleged violation of the statute, on the theory that his contributory negligence is no defense in such actions.

Wilkerson v. Willis Coal & Min. Co., 158 Ill. App. 620, p. 626.
 See *Kellyville Coal Co. v. Strine*, 217 Ill. 516.

In an action by a miner for injuries received while descending into the mine in a cage on the ground of the alleged violation of the statute by the mine operator in failing to have the cage properly covered, the mine operator cannot prevent a recovery on the ground that the injured miner violated the statute in putting in an empty car on the cage and taking picks with him, as this amounts only to contributory negligence on his part.

Darling v. Wood, 168 Ill. App. 272, p. 275.
 See *Illinois Collieries Coal Co. v. Davis*, 137 Ill. App. 15;
Merlo v. Johnston City & Big Muddy Coal & Min. Co., 173 Ill. App. 425, p. 430;
Swengel v. La Salle County Carbon Coal Co., 182 Ill. App. 623, p. 630.

The fact that a miner went to a dangerous place in the mine after being permitted to enter the mine with full knowledge of its dangers, against the direction of the superintendent and that in so doing he was guilty of contributory negligence, is no defense against a wilful violation of the statute by the mine operator in permitting the miner to enter the mine knowing that it was in a dangerous condition and without making such dangerous conditions safe.

Merlo v. Johnston City & Big Muddy Coal & Iron Co., 173 Ill. App. 414, p. 430;
Kellyville Coal Co. v. Strine, 217 Ill. 516;
Peebles v. O'Gara Coal Co., 239 Ill. 370.

Where a miner discovered an overhanging piece of slate in the roof of his room and attempted to pull it down and finally stuck his pick into it with that intention and immediately a large piece of slate fell from the roof and injured him, it can not be said that this was the proximate cause of the injury sufficient to defeat the miner's action, as this would be permitting the contributory negligence of the miner to defeat the provisions of the statute, and is not sufficient to defeat a recovery in an action based upon the mine owner's wilful failure to obey the statute.

Peebles v. O'Gara Coal Co., 239 Ill. 370, p. 373.
 See *Brunnworth v. Kerens-Donnewald Coal Co.*, 260 Ill. 202, p. 212.

The obligation resting upon a miner to exercise due care for his own safety and to obey the statute and not to disobey any order or rule of the mine operator made in pursuance of the statute, does not require him to act with the same deliberation and foresight which might be required of him under ordinary circumstances, where by reason of sickness he was compelled to leave his working place and while passing through an entry was, without his own fault and through the negligence of the operator, put in such apparent danger as to

cause him terror, loss of self-possession and bewilderment and as a natural consequence in attempting to escape put himself in a more dangerous position. Under such circumstances he is not, as a matter of law, charged with contributory negligence that will prevent him from recovering damages for injuries sustained.

Junction Min. Co. v. Ench, 111 Ill. App. 346, p. 340.

A miner or employee of a mine operator is not as a matter of law to be held guilty of contributory negligence where the conditions which occasioned his fright and caused him to jump were made by the negligent conduct or the wilful violation of the statute by the mine operator.

Loescher v. Consolidated Coal Co., 173 Ill. App. 526, p. 532.

See Wesley City Coal Co. v. Healer, 84 Ill. 126.

In an action for damages by a miner for injuries caused by a fall from the roof of his room due to the alleged failure of the mine operator to have the mine examined and to have the dangerous condition properly marked, the fact that the miner had actual notice and knowledge of the dangerous condition can not be interposed as a defense to prevent a recovery.

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 485.

See Huchett v. Williamson County Coal Co., 188 Ill. App. 321, p. 323.

The miner who with knowledge of the dangerous condition of the roof of his working place continued to work for two days after a proper demand for props is not sufficient to charge him with contributory negligence or with assuming the risk.

Russell v. O'Gara Coal Co., 188 Ill. App. 328, p. 329.

See Huchett v. Williamson County Coal Co., 188 Ill. App. 321, p. 323.

In an action for the death of a driver caused by an alleged wilful violation of the statute it is not necessary or proper for a court in its instructions to give directions or make allusions to any want of care on the part of the deceased miner and to the hazard of the mining business, as these matters are not material in an action for a wilful violation of the statute.

Hamilton v. Spring Valley Coal Co., 149 Ill. App. 10, p. 20.

See Kellyville Coal Co. v. Strine, 217 Ill. 576;

Adams v. Kansas & Texas Coal Co., 85 Mo. App. 45.

In an action by a miner for damages caused by a wilful violation of the statute on the part of the mine operator it is not necessary for the complainant to aver or prove that he was in the exercise of due care.

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 485.

In an action by a miner for damages for injuries under a common law count caused by the negligence of the mine operator, the complainant must aver and prove that he was in the exercise of due care and caution.

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 485.

The cases where contributory negligence has been held not to bar a recovery are cases of assumed risk.

Donk Bros. Coal & Coke Co. v. Stroff, 100 Ill. App. 576, p. 581.

See Carterville Coal Co. v. Abbott, 181 Ill. 495.

Pawnee Coal Co. v. Royce, 184 Ill. 402;

Odin Coal Co. v. Denman, 185 Ill. 413.

The liability of a mine operator for injuries caused by the employing and retaining an incompetent engineer in violation of this act can not be affected or nullified on the ground of the contributory negligence of such incompetent engineer under the fellow servant doctrine.

Niantic Coal Min. Co. v. Leonard, 126 Ill. 216, p. 217;

Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95, p. 97.

See Franci v. Tazewell, 157 Ill. App. 477, p. 482.

77. CONTRIBUTORY NEGLIGENCE—MINER'S VIOLATION OF DUTY.

The violation of a duty imposed by statute upon a miner is recognized as supporting the defense of contributory negligence if it in fact contributed to the injury complained of.

Seghetti v. Berry Coal Co., 186 Ill. App. 263, p. 268. .

A mine examiner injured by an explosion of gas while in a mine looking for an accumulation of gas, lack of air, loose roof, or other dangers that may exist, must know that he is likely to encounter an accumulation of gas at any time, and for him to proceed in such an examination with an open lamp is inexcusable carelessness, and the statute was not enacted for his protection.

Haveron v. Schoal Creek Coal Co., 184 Ill. App. 117, p. 122.

78. ASSUMPTION OF RISK—RISKS ASSUMED BY MINER.

A miner assumes the risks of danger and injuries from falling coal where in mining the coal he cuts under the seam and pulls the dirt and rock from under the coal, thereby permitting it to be squeezed down, causing the coal to fall and come down so it can be shoveled up and hauled out, and in such case the statute has no application.

Gluebas v. Spring Valley Coal Co., 159 Ill. App. 88, p. 89.

See Shook v. Majestic Coal & Coke Co., 165 Ill. App. 586;

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 161;

Yanloniz v. Spring Valley Coal Co., 185 Ill. App. 563, p. 565;

Owslanny v. Saline County Coal Co., 183 Ill. App. 518, p. 524.

In mining generally the miner cuts in under the seam of coal, pulling the dirt and rock from under the coal, so that it is "squeezed" down by the weight above, which causes it to fall, sometimes catching the miner. After the coal is removed the miner then removes from one-half foot to one foot of loose rock from the roof. As the work progresses the miner supports the roof as he goes along with props provided for that purpose. The vein at the working place is referred to as the face of the coal. A miner injured by a fall of coal under such circumstances can not recover in an action against the operator on the ground of an alleged violation of the statute in the failure of the operator to furnish props, as in such case the props would not only be useless to prevent the fall, but the purpose of the cutting under is to cause the coal to fall so that it can be taken out. Such an accident is one of the assumed risks and is not within the scope of the statute.

Gluebas v. Spring Valley Coal Co., 159 Ill. App. 88; p. 90.

See Shook v. Majestic Coal & Coke Co., 165 Ill. App. 586;

Mygatt v. Southern Coal & Min. Co., 180 Ill. App. 150, p. 159;

McKissick v. O'Gara Coal Co., 186 Ill. App. 511, p. 512;

Yanloniz v. Spring Valley Coal Co., 185 Ill. App. 563, p. 565.

The conditions under which a miner may work at a dangerous place at his own risk are those where the mine operator has complied with the law by having the miner's working place examined, the dangerous place marked by the mine examiner, and the miner sent to such place by the direction of the mine manager to make safe the particular dangerous conditions there existing.

Arkley v. Niblack, 272 Ill. 356, p. 362.

Under the statute of Illinois requiring a mine operator to cause his mine to be inspected each evening at the close of the day's work it is the duty of the miner, where the roof of his working place becomes dangerous after such inspection,

to discover the danger and to protect himself from accident thereby; and a miner of 32 years' standing must be presumed to have appreciated the danger of a place in the roof which on testing sounded loose.

Madison Coal Corporation v. Stullken, 228 Federal 308, p. 311.

79. ASSUMPTION OF RISK—RISKS NOT ASSUMED BY MINERS.

The doctrine of assumption of risk does not apply and is no defense to an action against a mine owner where an injury results to a miner by reason of a willful violation of the statute.

Spring Valley Coal Co. v. Patting, 210 Ill. 342, p. 353;

Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 395;

Franci v. Tazewell, 157 Ill. App. 477, p. 482.

In an action by a miner for damages for injuries occasioned by the willful violation of the statute on the part of the mine operator, the defense that the miner assumed the risk can not be interposed by the mine operator to defeat the action.

Peebles v. O'Gara Coal Co., 239 Ill. 270, p. 373;

Waschow v. Kelly Coal Co., 245 Ill. 510, p. 521.

The violation of the statute on the part of a mine operator by a failure to employ a licensed mine manager or pit boss renders the mine operator liable for an injury to a boss driver where such injury was the result of the failure to employ such mine manager. The boss driver by continuing in the employ of the mine operator after his knowledge of the failure of the mine operator to employ a mine manager did not thereby assume the risks of the violation of the statute.

Jupiter Coal Min. Co. v. Mercer, 84 Ill. App. 96, p. 102.

Where it is established that the proximate cause of an injury complained of was the failure of the mine operator to obey the statute, the policy of the police regulations contain in the miners' act does not require that either court or jury should indulge in refined distinctions as to assumed risks or contributory negligence on the part of the person injured.

Jupiter Coal Min. Co. v. Mercer, 84 Ill. App. 96, p. 102;

Bartlett Coal Co. v. Roach, 68 Ill. 174;

Litchfield Coal etc. Co. v. Taylor, 81 Ill. 590;

Catlett v. Young, 143 Ill. 74;

Illinois Fuel Company v. Parsons, 38 Ill. App. 182.

The common law doctrine that when an employee is warned or knows of the danger he assumes the risk or if he is guilty of contributory negligence he can not recover, can not be invoked as a defense under the statute. The fact that the deceased miner undertook to stop the cars by putting the dog into action after he had gained a place of safety is no defense in the case if a case is made under the statute.

Pate v. Gus Blair-Big Muddy Coal Co., 158 Ill. App. 578, p. 584.

A miner does not assume the risk of the negligence of employees of the same master who are not fellow-servants with him.

Illinois Third Vein Coal Co. v. Cloni, 215 Ill. 583, p. 589.

80. PROOF OF SIMILAR ACTS—ADMISSIBILITY.

Where it is necessary to prove the purpose intended, guilty knowledge, or any other state of mind to give to the mere act an actionable character, then proof

of other similar acts are admissible for the purpose of proving the state of mind necessary to give the particular act involved an actionable character.

Taylor Coal Co. v. Dawes, 220 Ill. 145;

Taylor Coal Co. v. Dawes, 122 Ill. App. 389, p. 396.

81. EXPERT EVIDENCE—ADMISSIBILITY—INSTANCES.

Expert testimony is not permissible ordinarily for the purpose of showing whether a condition was safe or dangerous, as that is the ultimate question to be determined by a jury; but where the character of the work or the conditions are such that it requires explanation of the means and methods of conducting the business or the exercise of precautions therefor, for the purpose of enlightening the jury upon questions pertaining to the operation of a mine, it is proper to permit the use of expert testimony to explain the conditions and circumstances.

Schultz v. Burnwell Coal Co., 180 Ill. App. 693, p. 697.

In an action for damages for the death of a miner it is competent to show by qualified experts in mining matters that the conditions and surroundings existing at the particular place and in reference to the alleged dangerous conditions were safe.

Hamilton v. Spring Valley Coal Co., 149 Ill. App. 10, p. 19.

See Donk Bros. Coal & Coke Co. v. Stroff, 200 Ill. 483;

Henrietta Coal Co. v. Campbell, 211 Ill. 216, p. 227;

Kellyville Coal Co. v. Strine, 217 Ill. 516;

Jacobs v. Madison Coal Corp., 165 Ill. App. 444, p. 448.

Brazil Block Coal Co. v. Hotel, 192 Fed. 108.

The opinion of an expert miner as to the effect of the firing of shots upon props and the conditions surrounding them is admissible in evidence in an action for damages by a miner where it was shown that shots were fired near the props.

Schultz v. Burnwell Coal Co., 180 Ill. App. 693, p. 697.

See Hamilton v. Spring Valley Coal Co., 149 Ill. App. 10;

Donk Bros. Coal & Coke Co. v. Stroff, 200 Ill. 483;

Henrietta Coal Co. v. Campbell, 211 Ill. 216;

Kellyville Coal Co. v. Strine, 217 Ill. 516.

Where a miner was injured while operating a new cutting machine in a mine and the equipment and character of the machine were in controversy it is proper to show by machine experts what constitutes a full equipment of such machine.

Morris v. O'Gara Coal Co., 181 Ill. App. 309, p. 317.

Expert witnesses may testify as to whether the use of bent and broken cross bars was a proper method of propping the roof of a mine or the proper method of cutting cross-cuts from one room to another; but it is not competent to ask expert witnesses whether or not a particular room in which a miner was at work was rendered a dangerous place in which to work because of the opening of a cross-cut. The question as to whether or not a room was rendered dangerous and unsafe in an action by a miner for damages for an injury, is a conclusion to be drawn by the jury from all the facts and circumstances proved in the case.

Hart v. Penwell Coal Min. Co., 146 Ill. App. 155, p. 158.

See Kellyville Coal Co. v. Strine, 217 Ill. 531;

LeGru v. Penwell Coal Co., 149 Ill. App. 555, p. 558;

Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497, p. 502.

Where in an action by a driver against a mine operator for damages for injuries occasioned by reason of a dangerous condition in the mine, and where witnesses with knowledge have testified as to the actual conditions in the mine at the place where the accident happened, it is not proper to prove by expert witnesses who have no knowledge of the actual conditions at the place of the

accident that the mine was completely and properly erected, constructed and operated.

Crooks v. Tazewell, 263 Ill. 343, p. 349.

In an action by a miner against a mine operator for damages for injuries caused by an explosion in a mine it is improper to permit a miner to testify that blown out shots were not uncommon occurrences in the mine.

Chicago, Virden Coal Co. v. Rucker, 116 Ill. App. 425, p. 426.

In an action by a miner for damages for injuries caused by an alleged violation of the statute by the mine operator in that a dangerous condition was not properly marked it is error to permit witnesses to testify that the neck of the room was safe or that it was unsafe.

LeGru v. Penwell Coal Co., 149 Ill. App. 535, p. 558.

See *Wullner v. Smith-Loehr*, 145 Ill. App. 466;

Hart v. Penwell Coal Co., 146 Ill. 155.

§2. QUESTIONS OF FACT—INSTANCES.

The question of the condition of a mine or an entry at the place where an accident occurred and where a miner was injured is one of fact to be determined by the jury and not by the mine examiner.

Olson v. Kelly Coal Co., 236 Ill. 502;

Aetitus v. Spring Valley Coal Co., 246 Ill. 32;

Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497, p. 503;

Piazza v. Kerens-Donnewald Coal Co., 179 Ill. App. 540, p. 544.

Whether or not a place in which a miner was injured was dangerous and whether or not the mine operator wilfully failed to comply with the statute are questions of fact for a jury in an action by the miner for injuries received.

Aetitus v. Spring Valley Coal Co., 246 Ill. 232;

Smith v. Illinois Collieries Co., 155 Ill. App. 148.

Whether or not a miner at the time of an injury complained of was engaged in the work of making a dangerous place safe under the direction of the mine manager or was only employed and directed to clean up an entry or cross cut, are questions of fact to be determined by a jury on the trial of the action.

Piazza v. Kerens-Donnewald Coal Co., 179 Ill. App. 540, p. 544.

In an action by a miner for damages for injuries caused by being thrown from a motor due to the alleged defective condition of the track, it is a question of fact for the jury to determine whether the motor was thrown from the track and the complainant injured by reason of the defective condition of the track, or whether the motor was thrown from the track because of the negligence of a fellow servant in failing to attend the switch.

Keller v. Chicago-Wilmington-Vermillion Coal Co., 184 Ill. App. 248, p. 253.

The question of the failure of a mine operator to furnish props and to have the roof examined and marked as required by the statute is one of fact to be determined by the jury.

Hollow v. Wasson Coal Co., 186 Ill. App. 512, p. 513;

Mattingly v. O'Gara Coal Co., 186 Ill. App. 591, p. 592;

Price v. Clover Leaf Coal Min. Co., 188 Ill. App. 27, p. 31;

Salerno v. Missouri & Illinois Coal Co., 188 Ill. App. 343, p. 344.

See *Kennedy v. Chicago & Carterville Coal Co.*, 188 Ill. App. 355, p. 350.

In an action for damages for the death of a miner, an instruction substantially in the language of the statute in regard to the duty of the mine owner to furnish props and of the deceased miner to secure his place for his own safety and in regard to the duties of the mine examiner, and which are applicable to the case as made by the evidence, was correctly given.

Arkley v. Niblack, 272 Ill. 356, p. 350.

In an action by a miner for damages for injuries caused by a fall from the roof on the ground of the alleged failure of the mine operator to furnish props and timbers the question as to whether the timbers furnished by the operator were of suitable dimensions and size to be used as cross-bars at the place where they were needed, and as to whether the miner and his helper could have set the timber up, because of its size, were questions of fact to be submitted to and determined by the jury.

Harmening v. Henrietta Coal Co., 149 Ill. App. 387, p. 389.

Whether the willful failure of a mine operator to comply with the provisions of the statute was or was not the proximate cause of the injuries or death of a miner, complained of, is a question of fact for the jury to determine in an action for damages for such injuries or death.

Olson v. Kelly Coal Co., 236 Ill. 502;

Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, p. 215;

Waschow v. Kelly Coal Co., 151 Ill. App. 41, p. 44;

Stanhaus v. Paradise Coal & Coke Co., 169 Ill. App. 75, p. 81.

Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478, p. 485;

Marralge v. Electric Coal Co., 188 Ill. App. 142, p. 144.

See *Kellyville Coal Co. v. Strine*, 217 Ill. 516;

Athens Min. Co. v. Carnduff, 221 Ill. 354;

Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41;

Brunnworth v. Kerens-Donnewald Coal Co., 169 Ill. App. 58.

Whether the willful failure of a mine operator to comply with the provisions proximate cause of an injury to the miner is a question of fact for the jury to determine in an action for damages for such injury.

Arkley v. Niblack, 272 Ill. 356, p. 362.

In an action for damages by a miner for the alleged failure of the mine operator to comply with the statute in preparing refuge places in a hauling road it is a question of fact to be determined by the jury on the trial of the case whether the alleged failure of the operator to make refuge places was the proximate cause of the injury complained of.

Loftus v. Illinois Midland Coal Co., 181 Ill. App. 197, p. 201;

Loftus v. Illinois Midland Coal Co., 193 Ill. App. 454, p. 456.

In an action by a miner for damages for injuries sustained by reason of the alleged willful violation of the statute on the part of the mine operator, it must be made to appear that the violation of the Statute complained of was the proximate cause of the injury, and this is a question of fact for the jury.

Haywood v. Dering Coal Co., 145 Ill. App. 506, p. 512;

Hickey v. Springfield Coal Min. Co., 149 Ill. App. 453, p. 456.

Proximate cause is probable cause and remote is improbable cause; and applying this rule to the size of a space for spragging and the work to be performed and the manner of its performance, the question as to whether the alleged violation of the statute in maintaining a dangerous place in an entry was the proximate cause of an injury complained of was a question of fact for the jury.

Eaton v. Marlon County Coal Co., 173 Ill. App. 444, p. 448;

Jenkins v. La Salle County Carbon Coal Co., 182 Ill. App. 36, p. 38.

What is the proximate cause of an injury is ordinarily a question of fact to be determined by a jury; but it can arise as a question of law when the undisputed facts are such that there can be no difference in the judgment of reasonable men as to the inferences to be drawn therefrom.

Halberg v. Citizen's Coal Min. Co., 149 Ill. App. 412, p. 415;

Odorizzi v. Southern Coal Mining Co., 151 Ill. App. 393, p. 395.

Whether the failure of a mine manager to place a conspicuous mark on the roof alleged to be dangerous and a fall from which caused the injury complained of, was the proximate cause of such injury, is a question of fact to be determined by a jury in the trial of the case.

Wilson v. Danville Collieries Coal Co., 264 Ill. 143, p. 146;
Smith v. Illinois Collieries Co., 155 Ill. App. 148, p. 151;
Gibson v. Wasson Coal Co., 190 Ill. App. 599, p. 601.
See Waschow v. Kelly Coal Co., 245 Ill. 518;
Plazzi v. Kerens-Donnewald Coal Co., 262 Ill. 30.

The question as to whether or not a shot wrongfully or unlawfully fired by a shot firer was the proximate cause of an injury resulting to such shot firer or whether the injury resulted from the operator's violation of the statute, are questions of fact to be determined by the jury in an action for damages for the injuries complained of.

Tomasi v. Donk Bros. Coal Co., 257 Ill. 70, p. 73.
See Henrietta Coal Co. v. Martin, 221 Ill. 460;
Mertens v. Southern Coal Co., 235 Ill. 540;
Davis v. Illinois Collieries Co., 232 Ill. 284;
Tomasi v. Donk Bros. Coal & Coke Co., 169 Ill. App. 47, p. 50.

Whether the death of a miner resulted from a willful failure of the mine owner to comply with the statute requiring inspection and posting of warning signs, and the exclusion of miners from dangerous gaseous places, and whether a miner was rightfully at the place at the time the injury occurred, are questions that are proper to submit to a jury in an action for damages for the death of a miner caused by the alleged negligence of the operator in failing to place warning signs.

Romani v. Shoal Creek Coal Co., 271 Ill. 360, p. 367.

83. DAMAGES—SINGLE RECOVERY.

All damages recoverable under the statute for the death of a miner must necessarily be recovered in a single action.

Willis Coal & Min. Co. v. Grizzell, 100 Ill. App. 480, p. 486;
Consolidated Coal Co. v. Donbrowski, 106 Ill. App. 641, p. 642;
Brennan v. Chicago & Carterville Coal Co., 147 Ill. App. 263, p. 271.
See Beard v. Skeldon, 13 Ill. App. 54.

An action brought by the father and mother for the death of a son, a coal miner, is for the entire recovery of damages and the right to control the prosecution and disposition of the case and a compromise and settlement by them is a release of the cause of action, and a second suit can not be begun under the general injuries act by the father as administrator to recover damages for the same injuries in favor of the heirs of the deceased miner. The fact that a suit may be brought under the general injuries act or under the mines and miners' act does not affect the question whether the same damages may be recovered twice.

McFadden v. St. Paul Coal Co., 263 Ill. 441, p. 443.

The statute provides that for an injury occasioned a right of action shall accrue for any direct damages sustained; and the word "direct" does not pertain to the cause of the injury, but to the effect of it.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 124.
See Coal Run Coal Co. v. Jones, 127 Ill. 379;
Illinois Fuel Co. v. Parsons, 88 Ill. App. 182;
Missouri & Illinois Coal Co. v. Schwalb, 77 Ill. App. 593.

In an action by a father and mother or other lineal heirs for damages for the death of a son, the damages are not limited to the pecuniary loss of the

plaintiff, but the pecuniary loss to all beneficiaries named in the act is proper in considering the measure of damages.

McFadden v. St. Paul Coal Co., 183 Ill. App. 36, p. 40.

See Cook v. Big Muddy-Carterville Min. Co., 249 Ill. 41.

In order to entitle a miner to recover for mental suffering as an element of damages in an action for personal injuries, there must be a suitable averment of the fact of mental suffering in the declaration; but it is sufficient to aver, after a description of the injuries, that the plaintiff "has suffered and will suffer much pain and anguish on account of said injuries."

Tomasi v. Donk Bros. Coal & Coke Co., 169 Ill. App. 47, p. 50.

See Tomasi v. Donk Bros. Coal & Coke Co., 257 Ill. App. 70, p. 73.

The damages to be recovered in an action by a miner against a mine operator for injuries must be the actual and proximate consequence of the wrongful act complained of.

French v. Clover Leaf Coal Min. Co., 190 Ill. App. 400, p. 403.

The damages provided in an action under this statute are classed by the legislature with other liabilities for violations of a statute, under the generic terms of penalties; and no conduct of an injured or deceased miner short of willfully seeking the injury or death complained of can bar a recovery where it appears that a coal mine operator's willful conduct brought about the injury or death.

Kellyville Coal Co. v. Strine, 117 Ill. App. 115, p. 125.

See Donk Bros. Coal & Coke Co. v. Stroff, 200 Ill. 483;

Donk Bros. Coal & Coke Co. v. Stroff, 100 Ill. App. 582;

Brennan v. Chicago & Carterville Coal Co., 147 Ill. App. 263, p. 271.

Section 33 of the act of 1899 authorizes an action for the wrongful death of a person in a mine caused by the willful violation of the statute, by the widow of the deceased, the lineal heirs or adopted children, or any other dependent person. But there can not be one recovery under the mines act and another recovery under the general statute authorizing action for wrongful death where the beneficiaries in the separate actions are the same.

McFadden v. St. Paul Coal Co., 183 Ill. App. 36, p. 39.

MINING RIGHTS—CONVEYANCE

SALE OR LEASE OF MINING RIGHTS.

LAWS 1861, P. 146.

FEBRUARY 20, 1861.

AN ACT to encourage Mining in the State of Illinois.

SECTION 1. Be it enacted, etc.: That the owner of any land may reserve, sell and convey, or lease mining rights, or the right to dig for and obtain iron, lead, copper, coal or other minerals from such land; and thereafter the sale for taxes of the land in which any mining right has been so conveyed or leased shall not operate to transfer or in any manner affect such mining right.

SEC. 2. Mining rights may be conveyed by deed or transferred by lease, and such deeds and leases may be acknowledged and recorded in the same manner as is now provided by law for the acknowledgment and record of deeds, and with like effect.

SEC. 3. This act shall take effect and be in force from and after its passage.

CODIFIED IN REVISED STATUTES, 1874.

REVISED STATUTES (HURD), 1874, P. 709.

MARCH 24, 1874.

AN ACT to revise the law in relation to mines.

SEC. 6. CONVEYANCE OF MINING RIGHT.—Any mining right, or the right to dig for or obtain iron, lead, copper, coal, or other mineral from land, may be conveyed by deed or lease, which may be acknowledged and recorded in the same manner and with like effect as deeds and leases of real estate.

SEC. 7. EFFECT OF CONVEYANCE.—When the owner of any land shall convey, by deed or lease, any mining right therein, such conveyance shall be considered as so separating such right from the land that the same shall be taxable separately, and any sale of the land for any tax or assessment shall not include or affect such mining right.

ANNOTATIONS.

1. MINING RIGHTS—CONVEYANCE OR LEASE.

2. MINING RIGHTS—TAXATION.

1. MINING RIGHTS—CONVEYANCE OR LEASE.

A mining right may properly be deemed a right to excavate in the earth for the purpose of obtaining minerals or other useful products.

People v. Bell, 237 Ill. 332, p. 337.

The statute provides that "any mining right" may be conveyed by lease, and also provides that when such mining right has been conveyed it shall be considered as so separated from the land that it is taxable separately.

People v. Bell, 237 Ill. 332, p. 336.

Under the act of 1861 a conveyance by the owner of land, by deed or lease of any mining right in such land, is a separation of such mining right from the land and the mining right shall be taxed separately.

Major, In re, 134 Ill. 19, p. 22;

Consolidated Coal Co. v. Baker, 135 Ill. 545, p. 551;

Simmons Coal Co. v. Board, etc., — Ill. — 113 N. E. 753.

The severance of the mineral from the remainder of the land may be accomplished not only by a conveyance of the mineral by the owner of the fee, but by a conveyance of the estate in the surface with a reservation of the mineral or ore beneath the surface to the grantor. An estate in fee in the mineral or ores beneath the surface may be vested in one person and an estate in fee in the surface of the land in another.

Major, *In re*, 134 Ill. 19, p. 22;
Sholl Bros. v. People, 194 Ill. 24, p. 26;
See Catlin Coal Co. v. Lloyd, 176 Ill. 275;
Maplewood Coal Co. *In re*, 213 Ill. 283, p. 285.

2. MINING RIGHTS—TAXATION.

When a grant is made of the land by the owner with a reservation of the mining right to the grantor, there is a separation of the rights of the property as between the land and the mining rights for the purpose of taxation.

Major, *In re*, 134 Ill. 19, p. 22;
Consolidated Coal Co., v. Baker, 135 Ill. 545, p. 551.

The conveyance of minerals beneath the surface of a reservation of the minerals with the right to mine in a deed conveying the surface is denominated a "mining right"; but a "mining right" is not a mere easement in the land and for that reason can not under the statute, be claimed as exempt from taxation.

Sholl v. People, 194 Ill. 24, p. 26;
Maplewood Coal Co., *In re*, 213 Ill. 283, p. 285.

Where a severance has been effected of the surface and the minerals beneath the surface, the two estates should be assessed separately for taxation. The assessment of the land by its governmental description should be assessed in the name of the owner of the surface, and the minerals should be assessed as a "mining right" in the name of the owner of the mineral, as the estate in the minerals is denominated "mining right" by the statute. Where the estate in the minerals has been created by a reservation in a deed conveying the surface, this would not be inappropriately called a "mining right reservation."

Sholl v. People, 194 Ill. 24, p. 27;
Maplewood Coal Co., *In re*, 213 Ill. 283, p. 285.

In making the valuation of lands on which there is coal or other mine or stone or other quarry, it necessarily requires a valuation of the mine or quarry, and if there is no division of ownership it will all properly be assessed with the fee, but if there has been a separation in ownership of the surface of the land and the mine or minerals, there may be a separate assessment for the purpose of taxation. The statute requires the assessment to be made in the names of the persons or corporations holding such property interest in the land, and while the total assessment must equal the value of the land augmented by the value of the coal in the land the assessment of each should be made separately according to the several holdings to the end that each shall pay a tax in proportion to the value of the property owned.

Consolidated Coal Co. v. Baker, 135 Ill. 545, p. 551.

A sale and conveyance of land by the owner with a reservation of all the coal therein and the right to mine the same is a separation of the surface and mineral rights for the purpose of taxation, and it cannot be urged on appeal from the decision of the Board of Supervisors on refusing to abate the taxes on the mining rights that there was no coal mine open or in operation upon the land and there was no evidence that coal existed in the land. If the surface

and mineral rights were separated it was sufficient under the statute for taxing purposes, but the charge that the taxes assessed were excessive cannot obtain upon such an appeal, for it was the duty of the assessor if the mining right was property to return an assessment thereof, and if it was valued too high another and a different mode is appointed out for redress. In such an appeal no question can be made as to the regularity of the assessment.

Major, In re, 134 Ill. 19, p. 22;

Consolidated Coal Co. v. Baker, 135 Ill. 545, p. 551.

A lease granting to the lessee all the oil and gas in and under the described premises, with the exclusive right to enter thereon at all times for the purpose of drilling and operating for oil, gas or water, and to erect all buildings and structures, machinery and appliances and lay all pipes necessary for the production, storage and transportation of oil, gas or water upon and from the premises, conveys such a mining right in the land that it can properly be taxed separately, and as it involves a freehold it should be assessed as real property.

People v. Bell, 237 Ill. 332, p. 336.

See Major, In re, 134 Ill. 19;

Consolidated Coal Co. v. Baker, 135 Ill. 545;

Sholl v. People, 194 Ill. 24;

Maplewood Coal Co., In re, 213 Ill. 283;

Kansas Natural Gas Co. v. Board of Commerce, 75 Kan. 335;

Jones v. Wood, 9 Circ. Ct. 560;

Kitchen v. Smith, 101 Pa. St. 452;

State v. South Pennsylvania Ore Co., 42 W. Va. 80.

Where land containing minerals was assessed for taxes at its full value in 1903 and the mining or coal rights were subsequently purchased by a third person, such mining or coal rights may be assessed for taxation against the purchaser, and the taxing officers are not compelled to wait the next quadrennial assessment, and the owner of the coal or mining rights is liable for the taxes thereon without reference to the assessed value of the land.

People v. O'Gara Coal Co., 231 Ill. 172, p. 174;

Maplewood Coal Co. In re, 213 Ill. 283, p. 286.

When as a matter of fact property is assessed to the original proprietor including the land and the mining rights, which belong to the same owner, it is the fault of the owner. He has his remedy and if he does not elect to avail himself of it but permits an excessive assessment to the extent that his mining rights depreciated the value of the land, he alone can make complaint.

People v. O'Gara Coal Co., 231 Ill. 172, p. 174.

See Maplewood Coal Co., In re, 213 Ill. 283.

The mere exhibition of the tax collectors' books showing payment of the taxes assessed upon the surface of the land by the owner thereof, is not sufficient to acquit the owner of the minerals of his duty and obligation to pay the taxes on the "mining right" owned by him in the same tract.

Sholl v. People, 194 Ill. 24, p. 27;

Maplewood Coal Co. In re, 213 Ill. 283, p. 285.

OIL AND OIL WELLS.

OIL—INSPECTION.

LAW 1869, P. 259.

APRIL 19, 1869.

AN ACT to provide for the inspection and sale of mineral oils used for illuminating purposes.

SECTION 1. Be it enacted, etc.: That the mayor and aldermen of any city, or the board of trustees of any town, wherein any coal, petroleum or other mineral oils are made, refined, produced or sold for illuminating purposes, and where five or more inhabitants petition for the same, shall appoint, annually, one or more suitable persons, not interested in the manufacture or sale of said oils, as inspectors thereof, and shall fix their compensation, to be paid by the parties requiring the services of said inspectors.

SEC. 2. Every inspector, before entering upon the duties of his office, shall be duly sworn. He shall also execute a bond to the state of Illinois, in such sum and with such surety as shall be approved by the probate court of the county where appointed, conditioned for the faithful performance of the duties imposed on him by this act, which bond shall be for the use of all parties or persons aggrieved by the acts or neglect of such inspector. And when called upon by any manufacturer, refiner, producer, dealer or purchaser of such oils, or by any officer mentioned in section five of this act, to test such oils, the said inspector shall do so, with all reasonable dispatch, by applying the fire test, as indicated and determined by J. Tagliabue's pyrometer, or some other instrument equally as accurate, with which he shall have provided himself at his own expense; and if the oils so tested will not ignite or explode at a temperature less than one hundred and ten degrees Fahrenheit, the inspector shall mark, plainly and indelibly, on each cask, barrel, or package, "approved, fire test being ———," but if said oils will ignite at a temperature less than one hundred and ten degrees Fahrenheit, as aforesaid, then the inspector shall mark on each cask, barrel or package, "condemned for illuminating purposes—fire test being ———." Said inspector, while in office, shall not buy, sell, bargain or trade, directly or indirectly, in any of the said oils. He may appoint deputies, for whom he shall be responsible, and who shall perform the duties of inspector. He shall keep an intelligible record of each inspection made, within twenty-four hours thereafter, in a book prepared for the purpose, which shall be opened to all parties interested. Any inspector found guilty of fraud, deceit or culpable negligence in the performance of any of his duties as prescribed in this section of this act, shall be punished by a fine not exceeding one hundred dollars, or imprisonment in the county jail not exceeding one month, or both, in the discretion of the court.

SEC. 3. Any manufacturer, refiner, producer or dealer who shall neglect to give notice to said inspector of any such oil in his or her possession, not already inspected by any duly authorized inspector of the state of Illinois, within two days after the same shall have been made, refined, procured or purchased, shall be liable to the same penalties provided in the second section of this act against inspectors.

SEC. 4. Any person, whether manufacturer, refiner, producer or dealer, who shall sell or attempt to sell to any person in this state any of said oils for illuminating purposes whether manufactured, refined or produced in this state or not,

which shall be below the "approved" standard—that is, having an igniting point less than one hundred and ten degrees Fahrenheit—as indicated and determined in the manner described in the second section of this act, or before having the same inspected as herein provided; or if any manufacturer, refiner, producer, dealer or inspector of said oils shall falsely brand the package, cask or barrel containing the same, as provided in the second section of this act, or shall use barrels, packages or casks having the inspector's brand thereon, and the oil therein not having been inspected, he or they so offending, upon conviction thereof, shall be liable to the same penalties provided in the second section of this act against inspectors. The casks, barrels or packages containing the same shall be forfeited and sold—one-half of the proceeds of such sale to go to the school fund of the county, and the other half to the informer—and, further, shall be liable to any person or persons for all damages sustained by him or them by the explosion or ignition of such oil thus unlawfully kept and sold.

SEC. 5. The mayor, aldermen and police of any city, and the board of trustees of any town in which an inspector is appointed in conformity with the first section of this act, or any one of said officers, within his respective city or town, shall cause all persons violating any of the provisions of this act to be prosecuted therefor.

SEC. 6. All prosecutions for fines and penalties, under the provisions of this act, shall be by action of debt or indictment in any court of competent jurisdiction, and the fines so collected shall be paid one-half to the informer and one-half into the school fund of the county wherein the same shall be collected.

SEC. 7. This Act shall be deemed a public act, and shall take effect and be in force from and after its passage. (Repealed.)

INSPECTION OF OIL.

LAWS 1871-72, P. 566.

APRIL 9, 1872.

AN ACT to provide for the inspection and sale of Mineral Oils and Fluids the product of Petroleum used for illuminating purposes.

SECTION 1. Be it enacted, etc.: That the mayor and aldermen of any city, or the board of trustees of any (town) wherein any coal, naphtha, gasoline, benzine or other mineral oils or fluids, the product of petroleum, are made, refined, produced or sold for illuminating purposes, and where five or more inhabitants petition for the same, shall appoint annually one or more suitable persons, not interested in the manufacture or sale of said oils or fluids, as inspectors thereof, and shall fix the compensation, to be paid by the parties requiring the services of said inspectors.

SEC. 2. Every inspector, before entering upon the duties of his office, shall be duly sworn. He shall also execute a bond to the state of Illinois, in such sum and with such security as shall be approved by the probate court of the county where appointed, conditioned for the faithful performance of the duties imposed on him by this act, which bond shall be for the use of all parties or persons aggrieved by the acts or neglect of such inspector, and when called upon by any manufacturer, refiner, producer, dealer or purchaser of such oils or fluids, or by any officer mentioned in section 5 of this act, to test such oils or fluids, the said inspector shall do so with all reasonable dispatch, by applying the fire test as indicated and determined by J. Tagliabue's pyrometer, or some other instrument equally as accurate, with which he shall have provided himself at his own expense, and if the oils or fluids so tested will not ignite or explode at a temperature less than one hundred and ten degrees, Fahrenheit, the inspector shall mark, plainly and indelibly, on each cask, barrel, or package "approved, fire

test being ——," but if said oils or fluids will ignite at a temperature less than one hundred and ten degrees, Fahrenheit, as aforesaid, then the inspector shall mark on each cask, barrel or package, "Condemned for illuminating purposes—fire test being ——." Said inspector, while in office, shall not buy, sell, bargain or trade, directly or indirectly, in any of the said oils or fluids. He may appoint deputies, for whom he shall be responsible and who shall perform the duties of inspector. He shall keep an intelligible record of each inspection made, within twenty-four hours thereafter, in a book prepared for the purpose, which shall be opened to all parties interested. Any inspector found guilty of fraud, deceit or culpable negligence in the performance of any of his duties as prescribed in this section of this act, shall be punished by fine not exceeding one hundred dollars or imprisonment in the county jail not exceeding one month, or both, in the discretion of the court.

SEC. 3. Any manufacturer, refiner, producer, or dealer, who shall neglect to give notice to said inspector of any such oil or fluid in his or her possession not already inspected by any duly authorized inspector of the state of Illinois, within two days after the same shall have been made, refined, purchased or produced, shall be liable to the same penalties provided in section 7 of this act against inspectors.

SEC. 4. Any person, whether manufacturer, refiner, producer or dealer, who shall sell or attempt to sell to any person in this state any of said oils or fluids for illuminating purposes, whether manufactured, refined or produced in this state or not, which shall be below the "approved" standard—that is, having igniting point less than one hundred and ten degrees, Fahrenheit—as indicated and determined in the manner described in the second section of this act, or before having the same inspected as herein provided, or if any manufacturer, refiner, producer, dealer or inspector of said oils or fluids shall falsely brand the package, cask or barrel containing the same, as provided in the second section of this act, or shall use barrels, packages or casks having the inspector's brand thereon, and the oil or fluid therein not having been inspected, he or they so offending, upon conviction thereof, shall be liable to the same penalties provided in the second section of this act against inspectors. The casks, barrels, or packages containing the same shall be forfeited and sold, one-half of the proceeds of such sale to go to the school fund of the county and the other half to the informer—and further, shall be liable to any person or persons for all damages sustained by him or them by the explosion or ignition of such oil or fluid thus unlawfully kept and sold.

SEC. 5. The mayor, aldermen and police of any city and the board of trustees of any town in which an inspector is appointed in conformity with the first section of this act, or any one of said officers within his respective city or town, shall cause all persons violating any of the provisions of this act to be prosecuted therefor.

SEC. 6. All prosecutions for fines and penalties, under the provisions of this act, shall be by action of debt or indictment in any court of competent jurisdiction, and the fines so collected shall be paid one-half into the school fund of the county wherein the same shall be collected.

SEC. 7. That "An act to provide for the inspection and sale of mineral oils used for illuminating purposes," approved April 19, 1869, be and the same is hereby repealed.

SEC. 8. Whereas an emergency exists, by reason of there being no sufficient law on this subject, requiring this law to take effect before July 1, 1872; therefore this act shall take effect from and after its passage.

INSPECTORS AND INSPECTION.

REVISED STATUTES 1874, P. 731.

MARCH 12, 1874.

AN ACT to revise the law in relation to oil inspection.

SECTION 1. APPOINTMENT OF INSPECTORS—TERM OF OFFICE—DEPUTIES.—Be it enacted, etc: That the mayor of any city, with the approval of the city council, and the board of trustees of any village or town may, and on the petition of any five inhabitants thereof shall appoint one or more inspectors for the inspection of coal oil, naphtha, gasoline, benzine and other mineral oils or fluids, the product of petroleum, and fix their compensation, to be paid by the party requiring their services. Every such inspector shall hold his office for one year and until his successor is appointed and qualified, unless sooner removed from office. He may appoint deputies, for whom he shall be responsible, and who shall take the same oath and be liable to the same penalties as the inspector. (Amended.)

SEC. 2. OATH—BOND—SUIT ON.—Every such inspector, before entering upon the duties of his office, shall take and subscribe the following oath:

I do solemnly swear (or affirm, as the case may be), that I will support the constitution of the United States, and the constitution of the state of Illinois, and that I will faithfully discharge the duties of the office of oil inspector, according to the best of my ability.

He shall also execute a bond payable to the People of the State, in such sum as shall be required by the city council or board of trustees, with one or more sureties, to be approved by the mayor or president of the board of trustees, conditions for the faithful discharge of the duties of his office. Any person aggrieved by his misconduct or neglect of such inspector may maintain suit thereon for his own use. (Amended.)

SEC. 3. INSPECTOR TO TEST.—Upon the application of any manufacturer, refiner or producer of, or any dealer in, any such oil or fluid, or of any officer or person to test any such oil or fluid, such inspector shall test the same with all reasonable dispatch by applying the fire test, as indicated and determined by J. Tagliabue's pyrometer or some other instrument or means equally accurate, with which he shall have provided himself at his own expense.

SEC. 4. TEST—CASKS MARKED—INSPECTOR NOT TO TRADE IN OIL.—If the oils or fluids so tested will not ignite or explode at a temperature less than one hundred and fifty degrees Fahrenheit, the inspector shall mark, plainly and indelibly, on each cask, barrel or package "Approved, fire test being ———;" but if said oils or fluids will ignite at a temperature less than one hundred and fifty degrees Fahrenheit, as aforesaid, then the inspector shall mark on each cask, barrel or package "Condemned for illuminating purposes; fire-test being ———." Said inspector, while in office, shall not buy, sell, bargain or trade, directly or indirectly, in any of the said oils or fluids.

SEC. 5. RECORD KEPT AND OPEN TO EXAMINATION.—He shall also, within twenty-four hours after making any inspection, make a full and fair entry thereof in a record book to be kept for that purpose, which shall be open to all persons wishing to examine the same.

SEC. 6. PENALTY FOR MISCONDUCT IN OFFICE.—Any such inspector or deputy who shall falsely brand any package, cask or barrel, or be guilty of any fraud, deceit, misconduct or culpable negligence in the performance of any of his official duties, shall be fined not exceeding \$200, and be liable to the party injured for all damages occasioned thereby.

SEC. 7. PENALTY FOR NEGLECT TO GIVE NOTICE OF, OR SELLING OIL NOT INSPECTED—COUNTERFEIT BRANDS, ETC.—Any manufacturer, refiner or producer of, or any dealer in coal oil, naphtha, gasoline, benzine, or other mineral oil or

fluid, the product of petroleum, in any city, village or town in which such inspector is appointed, who shall neglect to give notice to such inspector, of any such oil or fluid in his possession not already inspected by some authorized inspector of this State, within two days after the same is made or refined by him or received into his possession, or shall offer any such oil or fluid for sale before the same has been so inspected, or shall sell or attempt to sell to any person, for illuminating purposes, any such oil which is below the approved standard—that is, having igniting point less than one hundred and fifty degrees Fahrenheit, as indicated and determined in the manner herein provided, or shall use any package, cask, barrel, or other thing having the inspection brand thereon, the oil or fluid therein not having been inspected, or shall counterfeited any brand, shall be fined not exceeding \$200 and be liable to the party injured for all damages occasioned thereby, and all the casks, barrels or packages so falsely used, and their contents, shall be forfeited and may be seized and sold.

SEC. 8. FINES, HOW RECOVERED AND DISPOSED OF.—The fines herein provided may be recovered in the name of the People of the State of Illinois, before any Justice of the peace of the country where the offense is committed, and when collected, one-half shall be paid to the informer, and the other half and the proceeds of the sale of all casks, barrels and packages, and the contents thereof seized, as herein provided, shall be paid into the city village or town treasury. Repealed by Act of June 29, 1915, (Laws 1915, p. 533.) See page 352.

FIRST AMENDATORY ACT.

LAW 1887, P. 242.

JUNE 17, 1887.

AN ACT to amend section 1 and section 2 of an act entitled "An act to revise the law in relation to oil inspection," approved March 12, 1874, in force July 1, 1874.

SECTION 1. Be it enacted, etc.: That sections 1 and 2 of an act entitled "An act to revise the law in relation to oil inspection," approved March 12, 1874, in force July 1, 1874, be and the same are amended so as to read as follows:

SECTION 1. The judge of the county court of any county for townships outside of incorporated cities, towns and villages, the mayor of any city, with the approval of the city council, and the board of trustees of any village or town may, and on the petition of any five inhabitants thereof shall, appoint one or more inspectors for the inspection of coal oil, naphtha, gasoline, benzine and other mineral oils or fluids, the product of petroleum, and fix their compensation, to be paid by the party requiring their services. Every such inspector shall hold his office for one year and until his successor is appointed and qualified, unless sooner removed from office. He may appoint deputies, for whom he shall be responsible, and who shall take the same oath and be liable to the same penalties as the inspector.

SEC. 2. Every such inspector before entering upon the duties of his office shall take and subscribe the following oath:

I do solemnly swear (or affirm as the case may be), that I will support the Constitution of the United States, and the constitution of the State of Illinois, and that I will faithfully discharge the duties of the office of oil inspector according to the best of my ability.

He shall also execute a bond payable to the People of the State, in such sum as shall be required by the county judge, city council or board of trustees, with one or more sureties to be approved by the county judge, mayor, or president of the board of trustees, conditioned for the faithful discharge of the duties of his office. Any person aggrieved by the misconduct or neglect of such inspector may maintain (an action) thereon for his own use,

OIL INSPECTION—SECOND AMENDATORY ACT.

LAWS 1911, P. 432.

MAY 29, 1911.

AN ACT to amend sections 1 and 2 of an Act entitled, "An Act, etc. (same as in section 1).

SECTION 1. Be it enacted, etc.: That sections 1 and 2 of an Act entitled, "An Act to revise the law in relation to oil inspection," approved March 12, 1874, as amended by an Act approved June 17, 1887, be and the same are hereby amended to read as follows:

SEC. 1. The mayor of any city, with the approval of the city council, the president of the board of trustees of any village or incorporated town, with the approval of such board of trustees, may, and on the petition of any five inhabitants thereof shall, appoint one or more inspectors for the inspection of coal oil, petroleum, naphtha, gasoline, benzine and other mineral oils or fluids, fix the compensation of such inspectors and prescribe the fees to be paid by those for whom such inspectors render services. The county judge of any county may appoint such inspectors for territory not within the limits of any city, village or incorporated town, fix their compensation and fees. Every such inspector shall hold office for one year and until his successor is qualified, and, with the approval of the power appointing him, may appoint deputies for whom he shall be responsible, who shall take the same oath and be liable to the same penalties as the inspector. All fees collected by such inspector or deputy shall be by him paid into the county, city, village or town treasury and be the property of such county, city, village or town. The salary of such inspector shall not exceed five thousand dollars (\$5,000.00) per year.

SEC. 2. Every such inspector, before entering upon the duties of his office, shall take and subscribe the following oath:

I do solemnly swear (or affirm, as the case may be), that I will support the Constitution of the United States, the Constitution and laws of the State of Illinois, and that I will faithfully discharge the duties of oil inspector (or deputy oil inspector) according to the best of my ability.

He shall execute a bond payable to the People of the State, if appointed by the county judge, or the city, village or incorporated town by whose mayor or president of the board of trustees he shall be appointed, in such sum as shall be required by the power appointing him, with sureties to be approved by the power appointing him, conditioned for the faithful discharge of the duties of his office. Any person aggrieved by the misconduct or neglect of such inspector may maintain suit on such bond for his own use. (Repealed by Act of June 29, 1915. Laws 1915, p. 533.) See page 352.

OIL INSPECTION—THIRD AMENDATORY ACT.

LAWS 1913, P. 442.

JUNE 27, 1913.

AN ACT to amend section 1 of an Act entitled, "An Act to revise the law in relation to oil inspection," approved March 12, 1874, in force July 1, 1874, as amended by an Act approved May 29, 1911, in force July 1, 1911.

SEC. 1. Be it enacted, etc.: That section 1 of an Act entitled, "An Act to revise the law in relation to oil inspection," approved March 12, 1874, in force July 1, 1874, as amended by an Act approved May 29, 1911, in force July 1, 1911, be and the same is hereby amended so as to read as follows:

SEC. 1. APPOINTMENT OF INSPECTORS—TERM OF OFFICE—FEES—SALARY.—The mayor of any city, with the approval of the city council, the president of the

board of trustees of any village or incorporated town, with the approval of such board of trustees, may, and on the petition of any five inhabitants thereof, shall, appoint one or more inspectors for the inspection of coal oil, petroleum, naphtha, gasoline, benzine, and other mineral oils or fluids, fix the compensation of such inspectors and prescribe the fees to be paid by those for whom such inspectors render services. The county judge of any county may appoint such inspectors for territory not within city limits, village, or incorporated town, fix their compensation and fees. Every such inspector shall hold office for one year, and until his successor is qualified, and with the approval of the power appointing him, may appoint deputies, for whom he shall be responsible, who shall take the same oath and be liable to the same penalties as the inspector. All fees collected by such inspector or deputy shall be paid by him into the county, city, village or town treasury and be the property of such county, city, village or town. The salary of such inspector shall not exceed five thousand dollars (\$5,000) per year: Provided, that any city having a population of less than one hundred thousand (100,000), or any village or town may by ordinance provide that such inspector or deputy shall receive in lieu of salary the fees collected by him. (Repealed by Act of June 29, 1915. Laws 1915, p. 533. See below.)

OIL INSPECTION—REPEALING ACT.

LAWF 1915, P. 531.

JUNE 29, 1915.

AN ACT in relation to oil inspection.

SECTION 1. Be it enacted, etc.: That the mayor of any city, with the approval of the city council, the president of the board of trustees of any village or incorporated town, with the approval of such board of trustees, may appoint one or more inspectors for the inspection of coal oil, petroleum, naphtha, gasoline, benzine, mineral seal, signal and other mineral oils or fluids, fix the compensation of such inspectors and prescribe the fees to be paid by those for whom such inspectors render services. The county judge of any county may appoint such inspectors for territory not within city limits, village or incorporated town, fix their compensation and fees. Every such inspector shall hold office for one year, and until his successor is qualified, and with the approval of the power appointing him, may appoint deputies, for whom he shall be responsible, who shall take the same oath and be liable to the same penalties as the inspector. All fees collected by such inspector or deputy shall be paid by him into the county, city, village or town treasury and be the property of such county, city, village or town. The salary of such inspector shall not exceed five thousand dollars (\$5,000.00) per year: Provided, That any city having a population of less than one hundred thousand (100,000) or any village or town may by ordinance provide that such inspector or deputy shall receive in lieu of salary the fees collected by him.

SEC. 2. Every inspector, before entering upon the duties of his office, shall take and subscribe the following oath:

I do solemnly swear (or affirm, as the case may be), that I will support the Constitution of the United States and the Constitution of the State of Illinois, and that I will faithfully discharge the duties of the office of oil inspector according to the best of my ability.

He shall also execute a bond payable to the People of the State, in such sum as shall be required by the county judge, city council or board of trustees, with one or more sureties to be approved by the county judge, mayor, or president of the board of trustees, conditioned for the faithful discharge of the duties of his

office. Any person aggrieved by the misconduct or neglect of such inspector may maintain (suit) thereon for his own use.

SEC. 3. Upon the arrival of any such oil or fluid, such inspector shall test the same with all reasonable dispatch by applying the fire test, as indicated and determined by J. Tagliabue's pyrometer, or some other instrument or means equally accurate, with which he shall have provided himself at his own expense.

SEC. 4. If the oils or fluids so tested will not ignite or explode at a temperature less than one hundred and fifty degrees Fahrenheit, the inspector shall mark, plainly and indelibly, on each cask, barrel or package, "Approved, fire test being —;" but if said oils or fluids will ignite at a temperature less than one hundred and fifty degrees Fahrenheit, as aforesaid, then the inspector shall mark on each cask, barrel or package, "Condemned for illuminating purposes; fire test being ——" Said inspector, while in office, shall not buy, sell, bargain or trade, directly or indirectly, in any of the said oils or fluids, or be an employee of any refinery or firm dealing in the products herein mentioned.

SEC. 5. He shall also, within twenty-four hours after making any inspection, make a full and fair entry thereof in a record book to be kept for that purpose, which shall be open to all persons wishing to examine the same.

SEC. 6. Any such inspector or deputy who shall falsely brand any package, cask or barrel, or be guilty of any fraud, deceit, misconduct or culpable negligence in the performance of any of his official duties, shall be fined not exceeding \$200, and be liable to the party injured for all damages occasioned thereby.

SEC. 7. Any refiner or producer or any dealer in, or manufacturer, person, firm or corporation using, directly or in the manufacture of their product, coal oil, naphtha, gasoline, benzine, mineral seal, signal or other mineral oil or fluid, the product of petroleum, in any city, village or town in which such inspector is appointed, who shall neglect to give notice to such inspector, of any such oil or fluid in his possession, within two days after the same is made or refined by him or received into his possession, or shall offer any such oil or fluid for sale before the same has been so inspected, or shall sell or attempt to sell to any person, for illuminating purposes, any such oil which is below the approved standard—that is, having igniting point less than one hundred and fifty degrees Fahrenheit, as indicated and determined in the manner herein provided, or shall use any package, cask, barrel or other thing having the inspection brand thereon, the oil or fluid therein not having been inspected, or shall counterfeit any brand, shall be fined not exceeding \$200 and be liable to the party injured for all damages occasioned thereby, and all the casks, barrels or packages so falsely used, and their contents, shall be forfeited and may be seized and sold.

SEC. 8. All coal oil, naphtha, gasoline, benzine, or mineral seal, signal or other mineral oil or fluid, the product of petroleum, shipped by any refiner or producer within the State must be inspected by the inspector at the receiving point.

SEC. 9. The fines herein provided may be recovered in the name of the People of the State of Illinois before any justice of the peace of the county where the offense is committed, and if the offense is committed in the City of Chicago then before the Municipal Court of Chicago, and when collected, one-half shall be paid to the informer, and the other half and the proceeds of the sale of all casks, barrels and packages, and the contents thereof seized, as herein provided, shall be paid into the city, village or town treasury.

SEC. 10. "An Act to revise the law in relation to oil inspection," approved March 12, 1874, in force July 1, 1874, as amended by an Act approved May 29, 1911, in force July 1, 1911, and as further amended by an Act approved June 27, 1913, in force July 1, 1913, is hereby expressly repealed.

GAMBLING IN PETROLEUM.

LAWS 1887, P. 98.

JUNE 6, 1897.

AN ACT to suppress bucket-shops and gambling in stocks, bonds, petroleum, cotton, grain, provisions or other produce.

SECTION 1. Be it enacted, etc.: That it shall be unlawful for any corporation, association, co-partnership or person to keep or cause to be kept within this State any bucket-shop, office, store or other place wherein is conducted or permitted the pretended buying or selling of the shares of stocks or bonds of any corporation, or petroleum, cotton, grain, provisions or other produce, either on margins or otherwise, without any intention of receiving and paying for the property so bought, or of delivering the property so sold; or wherein is conducted or permitted the pretended buying or selling of such property on margins; or when the party buying any of such property, or offering to buy the same, does not intend actually to receive the same if purchased, or to deliver the same if sold. * * *

* * * * *

OILS USED IN COAL MINES.

LAWS 1895, P. 256.

APRIL 30, 1895.

AN ACT to prohibit the use of certain oils in coal mines and penalties for infraction of same.

SECTION 1. Be it enacted, etc.: That only a pure animal or vegetable oil, or other oil as free from smoke as a pure animal or vegetable oil, and not the product or by-product of rosin, and which has been inspected and complies with the following test, shall be used for illuminating purposes in the mines of this State.

All such oils must be tested at 60 degrees Fahrenheit. The specific gravity of the oil must not exceed 24 degrees Tagliabue. The test of the oil must be made in a glass jar one and five-tenths inches in diameter by seven inches in depth. If the oil to be tested is below 45 degrees Fahrenheit in temperature, it must be heated until it reaches about 80 degrees Fahrenheit, and should the oil be above 45 degrees and below 60 degrees Fahrenheit, it must be raised to a temperature of about 70 degrees Fahrenheit, when, after being well shaken, it should (shall) be allowed to cool gradually to a temperature of 60 degrees Fahrenheit, before finally being tested.

In testing the gravity of the oil, the Tagliabue hydrometer must be, when possible, read from below, and the last line which appears under the surface of the oil shall be regarded as the true reading. In case the oil under test should be opaque or turbid, one-half of the capillary attraction shall be deemed and taken as the true reading.

Where the oil is tested under difficult circumstances, an allowance of one-half degree may be made for possible error in parallax before condemning the oil for use in the mine. It shall be the duty of the State inspectors of mines in the several districts of the State to make the inspection provided for in this section before any such oil is sold for use in any mine in this State.

All oil sold to be used for illuminating purposes in the mines of this State shall be contained in barrels or packages branded conspicuously with the name of the dealer, the specific gravity of the oil, the date of shipment, the date and place of inspection and the name of the State Inspector of Mines making said inspection.

It is provided, however, that any material that is as free from smoke and bad odor and of equal merit as an illuminant as a pure animal or vegetable oil may be used at the pleasure of mine operators and miners. (Amended.)

SEC. 2. Any person or persons, firm or corporation which ships any oil contained in any barrel or barrels, package or packages, which are not branded as prescribed in section 1 of this Act, said oil to be used for illuminating purposes in coal or other mines, and any person or persons, firm or corporation, which sells any oil other than that prescribed in section 1, to be used for illuminating purposes in coal or other mines, and any person or persons, firm or corporation, having in charge the operation or running of any mine which, in a mine under his or its charge, uses or permits the use of any oil other than that prescribed in section 1 and any miner or mine employé who uses, with a knowledge of its character, in any mine of this State, any oil other than that prescribed in section 1 of this Act, shall be fined not less than \$5.00 nor more than \$50.00, and any individual, firm, company or corporation which sells any oil other than that prescribed in section 1 of this Act, in a quantity exceeding five barrels at one sale, to be used for illuminating purposes in coal or other mines, shall be fined not less than \$25.00 nor more than \$100.00.

Justices of the peace shall have jurisdiction to try any violations of this Act. Every person convicted of a second or other offense against this Act, in addition to the fine before provided shall be sentenced to the county jail for not less than ten days nor more than ninety days.

It shall be the duty of the inspector of mines in each district to notify the State's Attorney of the respective county of any violations of the above provisions. And the State's Attorney shall prosecute as in other cases of misdemeanors.

NOTE.—This act was doubtless repealed by implication by the general mining act of April 18, 1899, page 187. Expressly repealed by act of June 6, 1911 (Laws 1911, 388, p. 418).

OIL—TESTING—AMENDATORY ACT.

LAWS 1901, P. 247.

MAY 11, 1901.

AN ACT to amend section 1 of "An act, etc. (same as section 1).

SECTION 1. Be it enacted, etc.: That section one of "An act to prohibit the use of certain oils in coal mines, and penalties for infraction of same," approved April 30, 1895, in force July 1, 1895, be, and the same is hereby, amended so as to read as follows: That only a pure animal or vegetable oil, or other oil as free from smoke as a pure animal or vegetable oil, and not the product or by-product of resin, and which has been inspected and complies with the following test, shall be used for illuminating purposes in the mines of this State. All such oils must be tested at 60 degrees Fahrenheit. The specific gravity of the oil must not exceed 24 degrees Tagliabue. The test of the oil must be made in a glass jar one and five-tenths inches in diameter by seven inches in depth. If the oil to be tested is below 45 degrees Fahrenheit in temperature, it must be heated until it reaches about 80 degrees Fahrenheit; and should the oil be above 45 degrees and below 60 degrees Fahrenheit, it must be raised to a temperature of about 70 degrees Fahrenheit, when, after being well shaken, it should (shall) be allowed to cool gradually to a tem-

perature of 60 degrees Fahrenheit, before finally being tested. In testing the gravity of the oil, the Tagliabue hydrometer must be, when possible, read from below, and the last line which appears under the surface of the oil shall be regarded as the true reading. In case the oil under test should be opaque, or turbid, one-half of the capillary attraction shall be deemed and taken as the true reading. Where the oil is tested under difficult circumstances, an allowance of one-half degree may be made for possible error in parallax before condemning the oil for use in the mine. It shall be the duty of the State inspectors of mines, in the several districts of this State, to make the inspection provided for in this section before any such oil is sold for use in any mine in this State. All oil sold to be used for illuminating purposes in the mines of this State shall be contained in barrels or packages branded conspicuously with the name of the dealer, the specific gravity of the oil, the date of shipment, the date and place of inspection, and the name of the State inspector of mines making the said inspection. It is provided, however, that any material that is as free from smoke and bad odor and of equal merit as an illuminant as a pure animal or vegetable oil may be used at the pleasure of mine operators and miners.

PLUGGING OIL AND GAS WELLS.

LAWS 1905, P. 326.

MAY 16, 1905.

AN ACT in relation to sinking, filling and operating of oil or gas wells.

SEC. 1. Be it enacted, etc.: That before the casing shall be drawn from any well for the purpose of abandonment thereof, which has been drilled into any gas or oil bearing rock it shall be the duty of any person, firm or corporation having the custody or control of such well at the time of such abandonment, and also the owner or owners of the land wherein such well is situated, to properly and securely stop and plug the same in the following manner: Such hole first be solidly filled from the bottom thereof to a point at least twenty feet above such gas or oil bearing rock, with sand, gravel or pulverized rock, immediately on the top of which filling shall be seated a dry wood plug not less than two feet in length, having a diameter of not less than one-fourth of an inch less than the inside diameter of the casing in such well. Above such wooden plug such well shall be solidly filled for a least twenty-five feet with the above mentioned filling material, immediately above which shall be seated another wood plug of the same kind and size as above provided, and such well shall again be solidly filled for at least twenty-five feet above such plug with such filling material. After the casing has been drawn from such well there shall immediately be seated at the point where such casing was seated a cast-iron ball or tapered wood plug at least two feet in length, the diameter of which ball or the top of which wood plug shall be greater than that of the hole below the point where such casing was seated, and above such ball or plug, such well shall be solidly filled to top of well with aforesaid material.

SEC. 2. The person, firm or corporation owning or having control or custody of any such well, or the land in which any such well is situated, shall file or cause to be filed in the office of the recorder of the county in which any such well is located, within fifteen days after the same has been plugged, as provided in section 1, the affidavit of at least two persons who were present during the plugging of such well, which affidavit shall be recorded in the record books in the office of the recorder of such county, and shall set out in detail the manner in which such well was plugged and the depth of each such wood plugs and iron ball below the surface of the ground, and the record of such affidavit

shall be prima facie evidence in any court of a compliance with the provisions of this act.

SEC. 3. It shall be the duty of any person, firm or corporation sinking a well in any oil or gas-bearing rock, or having sunk such well and maintaining the same, to case off and keep cased off all fresh water from such well.

SEC. 4. Any person, firm or corporation that shall in any manner fail or refuse to plug a well in the time and manner provided in section 1 of this act, or shall fail or neglect to secure and file in the proper recorder's office the affidavit provided for and required in section 2 of this act, or shall fail and neglect to properly case off fresh or salt water from such well and keep the same cased off while said well is maintained, as provided in section 3 of this act, shall be liable to a penalty of one hundred dollars (100) for each and every violation thereof, and the further sum of one hundred dollars (\$100) for each ten days during which such violation shall continue, and all such penalties shall be recoverable in a civil action brought in any court of competent jurisdiction in any county in which said violation occurred, brought in the name of the State of Illinois on the relation of such county, and for the use and benefit of such county, and in all such cases, if there be recovery by the State, it shall recover in addition to such penalties a reasonable attorney's fee.

SEC. 5. Whereas, An emergency exists for the immediate taking effect of this act; therefore, the same shall be in force and effect from and after its passage.

OIL WELL NEAR COAL MINE—AMENDATORY ACT.

LAWS 1911, P. 426.

JUNE 7, 1911.

AN ACT to amend an Act entitled, "An Act," etc. (same as section 1).

SECTION 1. Be it enacted, etc.: That an Act entitled, "An Act in relation to sinking, filling and operating of oil or gas wells," approved and in force May 16, 1905, be, and the same is hereby amended to read as follows:

SEC. 1. No oil or gas well shall be drilled hereafter nearer than 250 feet to any opening to a mine used as a means of ingress or egress for the persons employed therein or which is used as an air shaft.

SEC. 2. It shall be the duty of any person, firm or corporation having the custody or control of any well drilled for gas or oil, and of the owner of the land in which such well is drilled, when the drill holes penetrates a coal seam, to file in the office of the recorder of the county in which said oil or gas well is drilled, and in the office of the State Mining Board, within fifteen days after completing said well, a statement and map giving the location and depth of every well so drilled, and the county recorder shall file and enter and index same in the records of his office relating to the titles to real property.

SEC. 3. Before the casing shall be drawn from any well for the purpose of abandonment thereof, which has been drilled into any gas or oil-bearing rock, it shall be the duty of any person, firm, or corporation having the custody or control of such well at the time of such abandonment, and also the owner or owners of the land wherein such well is situated, to properly and securely stop and plug the same in the following manner: Such hole first be solidly filled from the bottom thereof to a point at least twenty feet above such gas or oil-bearing rock with sand gravel or pulverized rock, immediately on the top of which filling shall be seated a dry wood plug not less than two feet in length, having a diameter of not less than one-fourth of an inch less than

the inside diameter of the casing in such well. And above such wooden plug such well shall be solidly filled for at least twenty-five feet with the above-mentioned filling material, immediately above which shall be seated another wood plug of the same kind and size as above provided, and such well shall again be solidly filled for at least twenty-five feet above such plug with such filling material. After the casing has been drawn from such well there shall immediately be seated at the point where such casing was seated a cast-iron ball or tampered wood plug at least two feet in length, the diameter of which ball or the top of which wood plug shall be greater than that of the hole below the point where such casing was seated and above such ball or plug such well shall be solidly filled to top of well with the aforesaid material.

SEC. 4. The person, firm or corporation owning or having control or custody of any such well, or the land in which any such well is situated, shall file or cause to be filed in the office of the recorder of the county in which any such well is located, within fifteen days after the same has been plugged, as provided in section 3, the affidavit of at least two persons who were present during the plugging of such well, which affidavit shall be recorded in the record books in the office of the recorder of such county, and shall set out in detail the manner in which such well was plugged and the depth of each such wood plugs and iron ball below the surface of the ground, and the record of such affidavit shall be prima facie evidence in any court of a compliance with the provisions of this Act.

SEC. 5. It shall be the duty of any person, firm or corporation sinking a well in any oil or gas bearing rock, or having sunk such well and maintaining the same, to case off and keep cased off all fresh water from such well.

SEC. 6. Any person, firm or corporation violating the provisions of section 1 or failing to comply with the provisions of section 2 of this Act, or who shall fail or refuse to plug a well in the time and manner provided in section 3 of this Act, or shall fail or neglect to secure and file in the proper recorder's office the affidavit provided for and required in section 4 of this Act, or shall fail and neglect to properly case off fresh water from such well and keep the same cased off while said well is maintained, as provided in section 5 of this Act, shall be liable to a penalty of one hundred dollars (\$100) for each and every violation thereof, and the further sum of one hundred dollars (\$100) for each ten days during which such violation shall continue, and all such penalties shall be recoverable in a civil action brought in any court of competent jurisdiction in any county in which said violation occurred, brought in the name of the State of Illinois on the relation of such county, and for the use and benefit of such county, and in all such cases; if there be recovery by the State, it shall recover in addition to such penalties a reasonable attorney's fee.

SEC. 7. Whereas, An emergency exists for the immediate taking effect of this Act; therefore, the same shall be in force and effect from and after its passage.

Approved June 7, 1911.

SALINES.

SALT SPRINGS—ACCEPTANCE.

REVISED STATUTES 1845, P. 57.

AUGUST 26, 1818.

WHEREAS, the Congress of the United States, in the act entitled "An act to enable the people of the Illinois Territory to form a Constitution and State government, and for the admission of such State into the Union on an equal footing with the original States, passed the 18th of April, 1818," have offered to this convention for their free acceptance or rejection, the following propositions, which, if accepted by the convention are to be obligatory upon the United States, viz:

* * * * *

2d. That all salt springs within such State, and the lands reserved for the use of the same, shall be granted to the said State for the use of the said State, and the same to be used under such terms and conditions and regulations as the Legislature of said State shall direct: Provided, The Legislature shall never sell nor lease the same for a longer period than ten years at any one time.

* * * * *

Done in convention at Kaskaskia, the 26th day of August, in the year of our Lord, 1818, and of the Independence of the United States of America, the forty-third.

SALTPETER.

LAWS 1817-18 (TERRITORY), P. 57.

DECEMBER 29, 1817.

AN ACT concerning the manner of working saltpetre caves.

Be it enacted, etc.: That if any person shall occupy or work any Salt Petre cave or caves in this territory without first securing the same with a good and sufficient fence of the height required in other cases by law, so that horses, and neat cattle can not get to the same; every person or persons so offending shall forfeit and pay to the owner of any horse or horses, or neat cattle that shall be killed by drinking the tray lye, a sum double the value of any such horse or horses or neat cattle, to be recovered before any court having competent jurisdiction to try the same by an action of debt.

SALTPETER CAVES.

REVISED STATUTES 1845, P. 400.

MARCH 3, 1845.

SEC. 1. All persons working saltpetre caves in this State, for the purpose of manufacturing saltpetre, shall, previous to commencing the manufacture of saltpetre, inclose such caves with a good and lawful fence, and keep the same at all times in good repair, so as to prevent cattle and other stock from gaining access thereto.

SEC. 2. All persons working saltpetre caves in this State, and not first complying with the preceding section, may be fined, in any sum not exceeding fifty dollars, to be recovered before any justice of the peace of the county in which the offence may be committed, upon complaint made by any person, in the name of the county commissioners' court of such county, one-half to the person suing therefor, the other to the county commissioners' court of the county; and shall also be liable for all damage which individuals may sustain by reason of their stock gaining access to saltpetre caves or manufactories.

LEASING SALINES.

LAWS 1819, P. 7.

FEBRUARY 6, 1819.

AN ACT authorizing the governor to lease the saline near Shawneetown.

SEC. 1. Be it enacted by the People of the State of Illinois represented in General Assembly, and it is hereby enacted by the authority of the same, That the Governor be, and he is hereby authorized to lease, for a term of two years commencing on the fourth day of December last to Johnathan Taylor, Timothy Guard, George Robinson, James Ratcliff, Meredith W. Fisher, Willis Hargrave, and their associates, the saline works near Shawneetown, according to the several propositions made by the said Johnathan Taylor, Timothy Guard, George Robinson, James Ratcliff, and Meredith W. Fisher, made to and accepted by the General Assembly at the present session upon such stipulations and regulations as he may deem proper: Provided, They shall surrender to this state their present leases from the United States.

SEC. 2. And be it further enacted, That it shall and may be lawful for the Governor and he is hereby authorized in case of any of the lessees shall hereafter forfeit their leases by any violation of the stipulations contained in their lease to cause possession thereof to be taken of such forfeited premises; and may lease them out to others upon such terms and conditions as he may deem necessary, during the residue of the term for which such lease may have been let.

SEC. 3. And be it further enacted, That the Governor shall be, and he is hereby, authorized to lease such other part or parts of the lands lying within the saline reservation which shall not be occupied for the purposes of the manufacture of salt, for the purposes of public inns, etc. * * *

* * * * *

DISCOVERY OF SALT WATER.

LAWS 1819, P. 114.

MARCH 4, 1819.

AN ACT to encourage the discovery of salt water.

WHEREAS, it appears to the satisfaction of this General Assembly that there are still existing concealed within this state many valuable salt springs and saline waters, which, if discovered might be beneficial to the public good: Therefore,

SEC. 1. Be it enacted, etc.: That for the purpose of encouraging the discovery of saline waters, and the manufacture of salt, the Governor is hereby authorized to lease to any person, persons, or company, any quantity of land not exceeding one section at any one place within this state, for the purpose of carrying into effect the manufactory of salt: Provided, Said lease shall not extend to affect in any wise the rights or any individual or individuals, nor Indians,

SEC. 2. Be it further enacted, That the Governor shall have power to require and obtain by agency, proxy, or by such other means as he may think proper to employ, any information that he may think requisite to enable him to encourage the discovery of salines; and if any person, persons or company shall make application to lease any such discoveries avowedly for the purpose of manufacturing salt, the Governor shall have power to lease to them the same on such terms and conditions as he may think most conducive to the interest of the public good. But in all cases the original discoverer shall have the right to claim the preference to said lease.

SEC. 3. Be it further enacted, That if any person, persons or company shall come forward claiming under the foregoing provisions of this act or claiming under the authority and right of the original discoverer any saline water and shall have given satisfactory evidence to the Governor of the validity and legality of their right, and that said lease is not to be on any of the lands before mentioned nor on the military bounty lands then he is hereby authorized to sign such lease or bargain to such person, persons or company of such discovery as aforesaid under such restrictions, limitations, and conditions as he may deem just: Provided, such lease or bargain shall not extend to a longer period than ten years from and after the signing and ratification thereof.

SEC. 4. And be it further enacted, That all necessary expenditures shall be paid out of the proceeds arising from said salt works so leased by the Governor and that no public money in the state treasury shall be appropriated toward carrying into effect the provisions of this act.

RENTS FROM SALINES.

LAWS 1819, P. 165.

MARCH 22, 1819.

AN ACT authorizing the governor of this state to receive certain rents from the lessees of the Ohio saline Lick.

WHEREAS, The act authorizes the Governor of the State of Illinois to lease the Ohio saline Lick, did not properly authorize him to receive the amount of money or salt due from the late lessees from the United States, which is due from the 26th day of August, 1818, until the 4th day of December of the same year: For remedy whereof,

SEC. 1. Be it enacted, etc.: That the Governor of this state be, and he is hereby authorized and empowered to receive and contract for the selling of or authorizing any agent or agents to receive or contract for the selling of any salt which is or may be found to be due or owing to this state from the lessees of the Ohio saline Lick, by virtue of a lease obtained by them from the United States and which lease was assigned by the President of the United States to this state from the 26th day of August until the 4th day of December in the year 1818.

SEC. 2. Be it further enacted, That should the Governor see proper to receive the rent in money or when the salt may be sold for money, in either case the Governor shall deposit the money in the treasury of this state.

LEASING SALINES.

LAWS 1819, P. 236.

MARCH 24, 1819.

AN ACT authorizing the leasing of Muddy Saline.

SEC. 1. Be it enacted, etc.: That the Governor of the state be and he is hereby authorized to lease the saline on Muddy River, known by the name of Muddy Saline near the town of Brownville, for any term of years not exceeding ten to such person or persons as may appear most advantageous to the state.

SEC. 2. And be it further enacted, That previous to making such lease, it shall be the duty of the Governor to publish in one or more public newspapers in this state thirty days previous to receiving proposals for the same, that the same will be leased on some day specified in such notice: and it shall be the duty of the Governor to file the contract entered into with the lessees of the same in the office of the Secretary of State for the benefit of the state and the monies arising from said saline shall be paid over according to the terms of the lease into the treasury of the state to be subject to be disposed of in the same manner that other public monies are.

GALLATIN COUNTY SALINE.

LAWS 1820-21, P. 103.

FEBRUARY 8, 1821.

AN ACT concerning the Gallatin County Saline.

SEC. 1. Be it enacted, etc.: That there shall be elected by the General Assembly a person to superintend the salt works in Gallatin County, who shall reside on the premises and who shall give bond to the Governor of the state of Illinois and his successors in office in the sum of \$8,000, with security to be approved by him, and who shall receive a salary of \$800 per year, payable quarter yearly out of the state treasury, who shall be liable to be suspended by the Governor until the meeting of the General Assembly and to be removed from office by the General Assembly for any palpable omission or misconduct in his office of superintendent. The said superintendent shall be elected to continue in office till the end of the present lease of the said saline.

SEC. 2. Be it further enacted, That it shall be the duty of the said superintendent as soon as he shall be qualified to enter upon and take possession of any establishment or establishments at the same saline where the lessee or lessees thereof have violated his or their lease by failing to comply with any of the covenants or conditions of his or their lease: and when any lease of any establishment at said saline now made, or that hereafter may be made, shall be violated by the lessee or lessees, it shall be the duty of the said superintendent to enter upon and take possession of the premises; and for the purpose of carrying this section into effect, the said superintendent is hereby authorized and empowered to summon to his aid as many persons as may be necessary to take and retain possession of any establishment or establishments at said saline, forfeited by any lessee or lessees. * * *

SEC. 3. Be it further enacted, That whenever the said superintendent shall have taken possession of any establishment of the said saline by virtue of this Act, it shall be his duty to advertise for five weeks in some public newspaper or newspapers that said establishment has been by him taken, and that upon a certain day in the said advertisement to be named, it will be let to the highest bidder, and the said superintendent on the day fixed shall proceed to lease the said establishment to the highest bidder for the residue of the term of the lease which shall have been forfeited, observing always to bind the lessee or lessees with all the conditions of the forfeited lease, and such other as he may deem necessary, and to require good and sufficient security.

SEC. 4. Be it further enacted, That it shall be the duty of said superintendent as soon as he shall be appointed and qualified to office to enter upon and take possession, for and on behalf of the state, of all such metal and other things which formerly belonged to the United States but which passed to this state by virtue of the grant of the said saline by Congress to this state in the year 1818: and to receive at a valuation to be fixed by three appraisers to be mutually

chosen by him and the party concerned, any metal or other property necessary to the making of salt, which may belong to any of the late lessees of the state, and which they may be willing to transfer in payment of their rent yet due or in arrear to the state: and the same metal when so taken or received in payment of rents, the said superintendent shall distribute among the present or any subsequent lessee or lessees in such manner as it may most properly appertain to their respective establishments, taking their receipts for the same, expressing the valuation thereof and their obligations to return the same amount at the expiration of their respective leases, with six per cent interest and the value of the same as appraised to them: the metal and other property returned to be of the same value (which shall be ascertained by appraisers as above provided) as that received by them in the first instance.

SEC. 5. Be it further enacted, That the said superintendent shall from time to time as it may be necessary have power to sue or distrain for rent as the same may become due and be unpaid; to receive the said rents and give acquaintances therefor and remit all monies received by him forthwith to the treasury and generally to do and perform all and singular which may appertain to his said office; Provided, that whenever any lessee shall attempt to remove his property before any or all of the rent shall become due, it shall be the duty of the said superintendent to proceed to distrain for the rent in the same manner as if the rent were actually due.

SEC. 6. Be it further enacted, That it shall be the duty of the governor of the state to manage and superintend all the other salines of the state in such manner as he may deem most conducive to the public interest: and he may appoint an agent or agents to aid him in said business who shall be paid out of the contingent sum: Provided, that he shall never lease or otherwise dispose of any such saline for a longer period than ten years.

SUPERINTENDENT OF GALLATIN COUNTY SALINE.

LAWS 1822-23, P. 76.

JANUARY 3, 1823.

AN ACT relative to the duties of the Superintendent of the Gallatin County Saline, and the Auditor of the State relative thereto.

SEC. 1. Be it enacted, etc.: That it shall be the duty of the Superintendent of the Gallatin County Saline to forward to the Auditor of Public Accounts, copies of leases hitherto entered into with the several lessees, and which have not yet expired.

SEC. 2. Be it further enacted, That hereafter it shall be the duty of the said Agent, whenever it shall become necessary to renew any lease or make any contract by which any payment shall be stipulated to be made to this state, forthwith to forward copies of such leases or contracts to the Auditor of Public Accounts.

SEC. 3. Be it further enacted, That it shall be the duty of the Auditor, upon receipt of such copies, to debit in the proper accounts, the amount due on any lease or contract made by said Superintendent. And it shall be the duty of said Superintendent to settle such accounts with the Auditor on or before the tenth day of December annually; paying over at the same time all monies by him received from the lessee or lessees to the Treasurer of this State.

SEC. 4. Be it further enacted, That it shall be the duty of the said superintendent to report biennially to the general assembly on or before the tenth day of their session, the situation of the public property under his superintendence; the amount of moneys received during the two preceding years;

amount due on leases, and generally whatever relates to the establishment that may be deemed of public interest.

SEC. 5. Be it further enacted, That the amount to be paid by the lessee or lessees, under any contract or lease hereafter made by the said superintendent, for the use of the metal and other property at the said saline belonging to this state, shall be at and after the rate of six per centum per annum interest, on the value of the same, as appraised to him or them, under the fourth section of the act entitled "An act concerning the Gallatin county Saline," passed the 8th of February, 1821.

VERMILLIAN SALINE.

LAWS 1822-23, P. 132.

FEBRUARY 12, 1822.

AN ACT relative to the Vermillian Saline.

SEC. 1. Be it enacted, etc.: That if any person shall commence boring or digging for salt water upon any part of the reservation of land at the Vermillian Saline, no other person shall bore or dig for salt water nearer to such improvement than one-quarter of a mile, unless the person first commencing, as aforesaid, shall neglect to pursue his undertaking for the space of two months, or shall certify in writing that he has abandoned it.

SEC. 2. Be it further enacted, That if any person shall succeed in procuring salt water, as aforesaid, the governor of this state shall grant him a lease, free from rent, of the section of land containing such salt water, for a term not exceeding five years, together with such quantity of timber, and privilege of procuring building stone, as will, in the opinion of the governor, be sufficient to enable such person to work to advantage whatever salt water he may have discovered.

SEC. 3. Be it further enacted, That the governor of this state is hereby authorized to grant to Seymour Treat and James B. McCall, for themselves and their associates, a lease of such additional wood land as he may deem proper, not exceeding one section, together with the privilege of procuring stone, for the use of their works.

RELIEF OF LESSEES.

LAWS 1824-25, P. 8.

DECEMBER 11, 1824.

AN ACT for the relief of certain Lessees of the Gallatin County Saline.

SEC. 1. Be it enacted, etc.: That Lowrey Hay, Benjamin White, Street and Lafferty, Leonard White, and A. G. S. Wight, lessees of portions of the Gallatin county Saline, be, and they are hereby, released and acquitted from the payment of any rent, which has accrued, and now remains unpaid, or which shall accrue until the fourth day of December, in the year 1826, upon the conditions hereinafter prescribed.

SEC. 2. Be it further enacted, That the aforesaid lessees are hereby authorized to lay out and expend, under the direction of the superintendent of the said saline, in attempts to discover salt water of a stronger quality, upon the premises leased by them, respectively, the rent which shall have accrued, by virtue of their present contracts of lease, from the fourth day of December, in the year 1823, to the fourth day of December, in the year of our Lord 1826: and the said lessees shall be entitled to a credit for so much as they shall thus lay out and expend: Provided, That the amount, thus laid out and expended, does not exceed the amount of rent accruing between the periods of time last aforesaid: And provided further, That in the event that the said lessees, or

either of them, shall succeed in obtaining salt water of a stronger quality, by one third, than that which has already been used, then, and in that event, such lessee or lessees shall be liable to pay for the period of time last aforesaid, the same rent as though this act had not been passed.

FENCING OFF SALINES.

LAWS 1824-25, P. 10.

DECEMBER 14, 1824.

REVISED CODE OF 1828-29, P. 142.

AN ACT to prevent Cattle from being injured in the vicinity of Salines.

SECTION 1. Be it enacted, etc.: That the owners, renters, or lessees, of any Salines within this state, who shall hereafter cause to be exposed any pickle, brine, or salt water, which in its nature is injurious and hurtful to any horned cattle, horses, hogs, sheep, mules, or other domestic animals, without having erected good and sufficient barricadoes, to prevent such animals and cattle from having access to the same, to the injury of such cattle and their owners, by causing the same to be injured or die, that such person or persons, so offending, against the provisions of the foregoing statute, shall be liable to prosecution before any court of competent jurisdiction in this state, and be liable in an action of damages to the owner or owners of any cattle that may suffer or die by such neglect, in the full amount of their value, and costs.

SEC. 2. Be it further enacted, That this law shall be in force from and after its passage.

LEASING OF BIG MUDDY SALINE.

LAWS 1824-25, P. 49.

JANUARY 3, 1825.

AN ACT to authorize the Governor to lease the Big Muddy Saline.

SECTION 1. Be it enacted, etc.: That the governor of this state be, and he is hereby empowered and required to lease the Saline on Big Muddy river to James Pearce, for the term of ten years, free of rent, upon conditions that the said James Pearce shall dig and bore a well of the depth of two hundred feet or more, and shall erect furnaces and buildings necessary for the manufacture of salt, and all the dwelling houses necessary for the accommodation of the persons to be employed in making salt; which said well and buildings shall be commenced within one year from the commencement of said lease, and shall be completed within two years after the commencement of said lease; and the governor shall require of the said James Pearce, a bond, with sufficient security, to be approved by him, in the penalty of two thousand dollars, conditioned as aforesaid, which bond shall be forfeited upon the failure of any of the aforesaid conditions: and upon the expiration of the said term of ten years, the said Pearce shall leave all the buildings and improvements made by him in good repair.

SEC. 2. Be it further enacted, That if the said Pearce shall be successful in procuring salt water, and should purchase metal to make salt, the person or persons who, at the end of this lease, shall rent the said Saline, shall purchase of said Pearce all the metal that he may then have on hand and in use, at a fair valuation, to be estimated by three disinterested persons.

VERMILLION SALINE.

LAWS 1824-25, P. 118.

JANUARY 15, 1825.

AN ACT to amend "An act relative to the Vermillion Saline," approved February 12, 1823, and to extend the Lease on the Shoal Creek Saline.

SEC. 1. Be it enacted, etc.: That if any person or persons shall succeed in procuring salt water, agreeably to the first section of the act to which this is an

amendment, the governor shall grant a lease, free of rent, to such person or persons, of a sufficiency of land, containing such salt water, and woodland, in all not exceeding one section, to be laid off as the governor may deem most advisable, to promote the manufactory of salt, together with the privilege of procuring building stone, as shall, in the opinion of the governor, be right, for the term of ten years; anything in the second section to the contrary notwithstanding.

SEC. 2. Be it further enacted, That the leases granted to Seymore Treat, and James B. McCall, for themselves and associates, be, and they are hereby extended to the 16th day of December, 1829, then to be complete and ended, upon the same stipulations and conditions expressed in their bond given on the 16th day of December, 1822: Provided, That this extension of lease shall not be granted unless the said Treat and McCall, or the legal holder or holders of said leases, shall, ten days previous to the expiration of the present leases, give new bond and sufficient security, to the governor, in the same sum stated in the present bond.

SEC. 3. Be it further enacted, That the lease entered into between the governor of this state on the part of the people, and Samuel Montgomery and Stephen Galard, of the county of Bond, on the 20th of September, 1823, relative to the Shoal Creek Saline, be, and the same is hereby extended until the year 1833; Provided, That the said Montgomery and Galard, shall, on or before the 20th of September, 1827, renew said lease, with the said governor, or his successor in office, to improve, if necessary, one hundred feet deeper than stipulated in the above named lease of the 20th of September, and in all other respects the extension of the lease shall be upon the same conditions as the one now in existence.

GALLATIN COUNTY SALINE.

LAWS 1826-27, P. 361.
(REVISED CODE).

FEBRUARY 2, 1827.

AN ACT regulating the Gallatin County Saline.

SECTION 1. Be it enacted, etc.: That at the present session of the general assembly, there shall be elected by joint ballot, a person who shall be styled "The superintendent of the Gallatin county Saline," who shall reside upon the saline tract; the said superintendent shall execute a bond to the governor of the state of Illinois, and his successors in office, in the sum of eight thousand dollars, with security to be approved by the governor, conditioned for the faithful performance of the duties of his office. The superintendent shall be subject to removal or suspension, by the governor for the time being, for any palpable misconduct or omission of duty in his office, until the meeting of the general assembly next ensuing such misconduct or omission, and may be removed for the like causes by the general assembly. The superintendent, except for the causes aforesaid, shall hold his office four years, and shall receive a salary of five hundred state paper dollars per annum, payable yearly out of the state treasury: Provided, the said salary shall never exceed the net profits of the rents of said saline, after paying all expenses.

SEC. 2. The said superintendent shall have full power and authority, to take care of the property of the state, comprehended within, or situate upon the tract called the Gallatin county salines, whether the same be real or personal, and shall have the general supervision thereof, and shall be vested with all rights and powers necessary to protect and preserve the interests of the state accruing from, or arising out of the said saline.

SEC. 3. The superintendent shall, within two months after the passage of this act, cause all the metal on the saline tract aforesaid, belonging to the state, to be collected, and shall advertise and sell the same so soon as practicable, for the highest price that can be had for the same, not less than three cents per pound, payable either in cash or good merchantable salt, well manufactured, delivered at the works in barrels at thirty-seven and a half cents per bushel, in four semi-annual instalments, the purchasers giving good and sufficient securities, payable to said superintendent, or his successors in office, for the use of the people of the state of Illinois. And in case any individual or individuals, who have received metal and owe for the same, be disposed to pay up and settle for the same in salt, it shall be lawful for said superintendent to take the amount due in salt, at thirty-seven and a half cents per bushel, put up and delivered at the lick as aforesaid, and may give them the same time to pay in as those who buy, four semi-annual payments, they giving bond and good security. Which salt, the superintendent shall sell on said saline tract, for the best price that can be had, not less than thirty-seven and a half cents per bushel for cash in hand.

SEC. 4. The superintendent is authorized to execute leases to Andrew Frazier and Benjamin White, for their several places, or so much thereof, as may be necessary to carry on their several manufactories, and lay off to each of them a sufficiency of land, and fuel and building timber, sufficient to use the wells and springs now occupied by them, or such as they may hereafter acquire, and to include all their present improvements. And they, the said Andrew Frazier and Benjamin White, shall each give good security, in their leases, to be approved by the superintendent, for the faithful performance of all the stipulations therein contained; and they shall each pay two hundred and fifty dollars per annum, payable half yearly; the leases to expire on the fourth day of December, 1836; and should the said Andrew Frazier, or Benjamin White fail, or refuse to execute said lease or leases, within two months from the passage of this act, it shall be the duty of the superintendent to enter upon, and take possession of either, or both of said places, (as the case may be,) and advertise in some newspaper printed in this state, that he will lease such place or places, to the highest and best bidder, having in all cases, reference to the production of the greatest possible quantity of salt; and if any lessee shall fail to pay any rent within thirty days after the same shall become due, the superintendent shall have power, and it shall be his duty, immediately to dispossess said lessee or lessees, and proceed against them by action or otherwise, in the most summary and expeditious mode, to recover the rent due from them or any of them, and may proceed again to lease the premises for the unexpired time of the original lease.

SEC. 5. The superintendent is authorized to lease to Lowry Hay, the lot now in his possession, for five years, from the passage of this act, free of rent; and after that time, should the said Hay discover water of equal strength with that now used by White and Guard, he shall be chargeable with the same rent; and should the discovery be of an inferior quality, the superintendent may fix such rent as is reasonable and just, according to his discretion; the said Hay's lease to continue until the fourth day of December, 1836.

SEC. 6. The superintendent may lease to any person or persons, any vacant place on said tract, for the purposes of manufacture or discovery, on the same terms as are before provided for Lowry Hay; in all such cases, the leases granted, are to expire on the fourth day of December, 1836; and the superintendent shall not grant to any person more than one lease, nor more than one lot in the same lease; nor shall he in any case take another lessee or salt maker as security.

SEC. 7. The superintendent is authorized to enter upon any premises by him leased as aforesaid, to make distress for any rent due, or where any payment is about to become due, and the lessee has or is about to remove away, the said superintendent shall forcibly, and without delay, seize and take possession of all his works, salt, and any other personal property, and after advertising the same in four of the most public places for fifteen days, shall fairly expose and sell the same, or so much thereof, as will pay the rent due, or the payment about to become due, and all reasonable costs and charges; and for the purpose of carrying this provision into effect, the superintendent is hereby authorized and empowered, to summon to his aid as many persons as may be necessary to take and retain possession of any establishment, or other property of said lessee; and any person so summoned by said superintendent, failing or refusing to aid him, shall be fined by said superintendent, in any sum not less than five, nor more than twenty dollars; and said superintendent is hereby authorized and empowered to issue his execution to any constable of the county, and collect the same with costs, for the use of the state. And should any person or persons commit any waste, spoil, or trespass, on the vacant lands of the said saline tract, the superintendent is authorized to employ a sufficient force to expel such person or persons therefrom; and on complaint of any lessee and request to the said superintendent, he may employ the like force, and expel with strong hand, any person or persons trespassing on the tract, or any part thereof, so leased as aforesaid.

SEC. 8. It shall be the duty of the superintendent whenever any lease shall be taken by the authority of this act, to furnish the auditor with a true copy thereof, and to account with the auditor and pay over to the treasurer on the first Monday of December annually, all monies accruing to the state, from the said saline, whether by lease or otherwise; and shall further, on or before the tenth day of every regular session of the general assembly, make a full and complete report of all matters and things relating to the said saline.

SEC. 9. Andrew Frazier, shall within three months after taking his lease, erect, or cause to be erected and kept up, a ferry across Saline creek, at Island ripple, the rates to be fixed by the county commissioners; and when established, he shall in all respects be governed by the act regulating ferries. If he shall neglect or refuse to establish one, the county commissioners may take possession of the place for the purpose, and erect one on application or otherwise.

SEC. 10. The superintendent may occupy the farm free of rent, on the lot lately occupied by Street and Lafferty; and he may be absent on business a reasonable time, leaving an agent to act for him at his own risk and expense.

SEC. 11. From and after the first day of August next, all salt sold by any lessee, or any other person selling at any of the works, shall be weighed in scales by standard weight.

SEC. 12. Timothy Guard, is hereby released from the excess of rent by him covenanted to be paid as lessee, of lot number two, of the Gallatin county saline, over and above five hundred dollars per annum. All laws inconsistent with this act are hereby repealed.

APPROPRIATING SUMS RECEIVED FROM SALES OF SALINES.

LAWS 1822-29, P. 142.
REVISED CODE, 1826-31.

DECEMBER 19, 1822.

AN ACT to amend and continue in force the act entitled "An Act concerning saline reserves, a penitentiary, and the improvement of certain navigable streams", approved 15th February, 1827.

SECTION 1. Be it enacted, etc.: That so much of the first section of said recited act, as requires the selection for water works, specified in said section, to be in

addition to the thirty thousand acres therein mentioned, be, and the same is hereby, repealed. So much of the 26th section of the act, to which this section is an amendment, as postpones the appropriation of one thousand dollars of the next avails of the sales, after twenty thousand dollars shall be realized, be, and the same is hereby, repealed; and the said sum of one thousand dollars shall be out of the next avails of said sale, after fifteen thousand dollars be realized.

SEC. 2. The commissioners, who are required by the eighteenth section of this act, to make their report to the present General Assembly, are authorized and required to make their report on the fifth day of the session of the next General Assembly.

SEC. 3. The report of Leonard White, John Black, and Benjamin Cumming, commissioners appointed by the first section of the act, to which this is an amendment, be, and the same is hereby, approved and confirmed: and the residue of said recited act, to which this is an amendment, is hereby declared to be in full force from and after the passage of this act.

SEC. 4. The sum of five hundred dollars of the avails of said sales is appropriated to the improvement of the state road across Cash River bottom, in Alexander county, to be expended under the direction of Henry Sowers, William Price, and John Fisher.

GALLATIN COUNTY SALINE.

LAWS 1830-31, P. 165.

DECEMBER 25, 1830.

AN ACT to amend an act entitled "An Act regulating the Gallatin County Saline."

SECTION 1. Be it enacted, etc.: That the superintendent of the Gallatin county saline shall receive for his services, as superintendent, the sum of three hundred and fifty dollars per annum.

SEC. 2. So much of the act entitled, "An act regulating the Gallatin county saline," as relates to the salary of the superintendent, is hereby repealed.

MANUFACTURE OF SALT.

LAWS 1830-31, P. 162.

REVISED CODE, 1830-31, P. 162.

JANUARY 11, 1831.

AN ACT to encourage the manufacture of salt, and for the benefit of Conrad Will, and others.

SECTION 1. Be it enacted, etc.: That the Governor be, and he is hereby authorized to execute a lease to Conrad Will, of the Muddy Saline, free of rent, which lease shall end on the first day of December, 1840, and commence at the expiration of the lease granted to James Pearce.

SEC. 2. The superintendent of the Gallatin county saline is hereby authorized to permit any person, or persons, to enter upon any vacant lot of the said saline; or with leave hereafter to be granted by the lessee, upon any — occupied lot, and to dig there for salt water, committing no unnecessary waste; and if such person, or persons, shall succeed in the discovery of salt water of equal or greater strength than that now generally used at said saline, he or they shall be entitled to the exclusive right of boiling the same, and manufacturing salt therefrom, free of rent, for the period of ten years from the day the salt water is discovered, and shall moreover have sufficient timber, for fuel and other purposes, to carry on such manufacture for the period aforesaid.

SEC. 3. If any of the present lessees shall make new discoveries of salt water as above, they shall have the same rights and privileges in respect to such new discovered water as is granted above to other persons: provided, they shall com-

ply faithfully with the conditions of their existing leases, so far as shall relate to all other matters except new discoveries of salt water hereafter made.

SEC. 4. The said person, or persons, and old lessees aforesaid, shall at the expiration and end of their respective leases as aforesaid, surrender up to the state all the works and improvements so made, in good repair, except the metal used in boiling salt water: provided, that nothing in this act shall be so construed as to interfere with any of the rights or privileges belonging to the present lessees.

SEC. 5. The old lessees who do not make further discoveries of salt water, as aforesaid, may be permitted, to hold the lots now leased to them, until the first day of December, 1840, by their paying to the state, the same rent annually, that is now specified in their several leases.

SEC. 6. No person shall be entitled to the benefits of this act relative to newly discovered salt water, who shall dig for, and discover salt water, so near another well of good salt water, as to injure the quality or quantity of the same.

SEC. 7. Permission is hereby granted to any person, or persons, from and after the expiration of the lease of the big muddy saline, heretofore granted by the Governor of this state, to James Pearce, to enter upon the said saline reservation, and dig for salt water, and if such person, or persons, shall succeed in the discovery of said water, he or they shall be entitled to the exclusive right of boiling the same, and manufacturing salt therefrom, free of rent, for the term of ten years from the discovery of said water; or, with leave hereafter to be granted by the present lessee or lessees, of the said big muddy saline, any person or persons, may at any time after such leave given, enter upon the said saline reservation and dig for water as aforesaid, and in the event of his or their discovering the same, he or they shall be permitted to use the same for the manufacturing of salt, for the term aforesaid, free of rent.

VERMILLION SALINE.

LAWS 1830-31, P. 163.

JANUARY 28, 1831.

AN ACT concerning the Vermillion Saline.

SEC. 1. Be it enacted, etc., That John W. Vance, the present occupier of the Vermillion saline, shall have the use, occupancy and possession of said saline, the land included in the original lease to McCall, Treat, and others, and also one half section more, to be by him selected, for timber, free of rent, until the first day of January, 1833; provided, that said Vance shall give bond, with sufficient securities, during the present session of the Legislature, made payable to the Governor and his successors in office, for the use of the people of the state, in such penalty as the Governor shall direct, conditioned that he will go on and bore the present well, to the depth of 500 feet, make all the salt he possibly can, by reasonable exertions, committing no unnecessary waste of timber, and that he will give up to the state, peaceably, and without delay, at the expiration of said term, the lease so granted, with all the buildings and improvements of every nature and kind, in good repair, saving to himself, as his property absolutely, all the metal: which lands and improvements will then be unincumbered, and the property of the state.

SEC. 2. If said Vance shall not give bond with securities, as above stated, the Governor shall cause a final settlement to be made with said Vance, as contemplated in the original bond given by McCall, Treat, and others, on fair and equitable principles, deducting the sum which may be found due for the use of said works, from the 16th of December, 1829, until settlement shall be made, and in

order to effect the settlement, the Governor may appoint an agent, to act for the state, with general or special powers to act and close the concern with the said Vance, and to lease the works for a term not exceeding two years.

SEC. 3. In making selections by settlers on the Vermillion saline reserve, granted in the act passed for the benefit of John Powell and others, the same shall be made by legal divisions, north and south lines, as now observed by Congress; and said act shall not be construed to apply to sections 16 and 17, upon which the salt works are situated: No preemption right shall be given on said sections.

GALLATIN SALINE.

LAWS 1835-36, P. 263.

JANUARY 16, 1836.

AN ACT relating to the Gallatin Saline, and the Lands belonging to the same.

SEC. 1. Be it enacted, etc., That it shall be the duty of Tyler D. Hewitt, present commissioner of the Gallatin Saline, to make out an accurate map of the saline reserve, noting therein, by distinct shades, the amount of lands that have heretofore been directed to be sold and such as have not been directed to be sold. He shall also note on said map the particular section, or subdivision of a section that contains salt wells that have heretofore been used, or are now used for making salt, at said saline: and he shall moreover, procure a well bound book, in which he shall enter, in proper order, the lands that may remain the property of the state, after the land is taken out which has been already sold, or directed to be sold; all which he shall fully certify, with explanatory notes of said map, and a full description of land not directed to be sold.

SEC. 2. That John Crenshaw, Leonard White, Lee Hargrave, Joseph H. Hayes, William Hewitt, or a majority of them, be, and they are hereby appointed commissioners, to lay off, and report to said commissioner of the Gallatin Saline, as many lots of land, to be called saline lots, as they may think proper, not less than six, in said salines; which lots shall include the wells that are now affording salt water or that are under lease, each well now worked as aforesaid, to be a lot; and as there are wells not leased or used, as aforesaid, to lay off such other lots, including old wells, or prospects for salt water, as shall make up at least the number of six, as first above mentioned. The commissioners in this section, shall designate in said report, the lots of land, including the wells, that are now under lease, and those that are not. Said lots of land, so including wells and salt water prospects, as aforesaid, shall not consist of more than forty acres, but may be less, and may be made without regard to the lines of the United States' survey; in which latter case they shall report a plat and description of such new survey, so made, for the purposes aforesaid. The aforesaid commissioners, after laying off, and properly marking, by courses and distances, and planting permanent stones at the corner, and numbering the lots so as to be distinctly known, shall proceed to select and lay off, a lot of land to each, upon which there is stone coal, for fuel for such saline lots, numbering and describing such coal lot, and setting forth, distinctly to what saline lot it may belong; which said lots for water and coal, shall be sold, one for water, and one for coal, together. And at the Half Moon lick, (which by this act is contemplated to be divided into four parts,) the said commissioners shall lay off a tract of land around the saline lots, not exceeding six hundred and forty acres, outside of said lots, which shall forever remain as common, for salt making purposes, not more than one-eighth of which shall be acquired by any one proprietor of a saline lot, at any one time.

SEC. 3. That all the lands and saline lots mentioned in the foregoing section, shall be subject to sale in the manner, and under the restrictions hereinafter mentioned, that is to say: all those lands not included in any of the existing leases of any part of said saline, and all those saline lots, as mentioned in the preceding section, that are not included in any existing lease, shall be offered at public sale, after advertising the same, with proper description and designation thereof, in at least five public papers, that is to say: one in New York, one in Boston, one in Philadelphia, one in Cincinnati, and two in the state of Illinois, at least eight weeks, commencing at least three months before the day appointed by such advertisement for such sale; said advertisement shall designate the time and place of such sale. And on the day appointed as aforesaid, the "commissioners of the Gallatin Saline" shall first offer the land so advertised, beginning at the lowest number of township, range and section, and shall sell the same to the highest bidder; Provided, That any such bid shall not be less than fifty cents per acre. And after such sale as aforesaid, if any of said lands shall remain unsold, the same may be purchased at private entry, at fifty cents per acre. And after said lands shall be offered at public auction, as aforesaid, the said "commissioners of the Gallatin Saline" shall proceed to offer, at public auction, the saline lots, including wells, or salt water prospects, to the highest bidder; Provided, That if the said lots, last mentioned, shall not sell at such public auction they shall in no case be entered at private sale.

SEC. 4. That after the expiration of the year 1840, the lands now included in any lease, and the wells, or salt water prospects, belonging to any saline lot, as mentioned in the second section of this act, may be sold by the commissioners of the Gallatin Saline, in the manner prescribed in the third section of this act; or if the said lessees shall, at any time, relinquish their right by lease, to any of the lands included in any of their respective leases, the same may be sold as before prescribed; or if they, or any of the said lessees, shall surrender to the state their respective leases, of said saline, then the wells, or salt water prospects, on said lease, so surrendered, may be sold as before prescribed, under the same conditions and restrictions; Provided, That nothing herein contained, shall be so construed as to permit the present lessees to use or occupy any of the land included in their respective leases, for any purpose but the manufacture of salt, and all contracts or leases in relation thereto, by said lessees, shall be void, and shall not be enforced by any court or jurisdiction in this state.

* * * * *

MANUFACTURE OF SALT AT GALLATIN SALINE.

LAWS 1840-41, P. 291.

DECEMBER 9, 1840.

AN ACT to provide for the manufacture of salt at the Gallatin Saline.

WHEREAS, The existing leases in the Gallatin Saline are about to expire on the first of December, 1840, and whereas, also; it is to be apprehended that salt making will altogether cease unless some legislative action is immediately had, and whereas, also, it is inexpedient that the wells and salt springs should at this time be put up to sale because that it might endanger the future manufacturing of salt at that saline for years to come to the great inconvenience of a large portion of the people of the state, therefore,

SEC. 1. Be it enacted, etc.: That the wells of salt water of the Gallatin Saline situate in the Half Moon heretofore occupied by Timothy Guard and Benjamin White under lease from the state and which expire on the first day of December 1840, be and the same are hereby leased to John Crenshaw, for and during

the full end and term of ten years, fully to be completed and ended, commencing on the second day of December in the year 1840, together with all the rights and appurtenances and a sufficient proportion of common appurtenant to the same as laid off in pursuance of an act of the Legislature passed January 16, 1836, together with the present pipe line, leading from the well now worked to the furnace, and there is also hereby granted to the said Crenshaw the right of way over any lands now owned by the state; and when the same passed over the lands of others and disagreement should arise the said Crenshaw shall have the same proceedings as in cases of right of way.

SEC. 2. In consideration of which grant in the foregoing section made, the said Crenshaw shall, on or before the 10th day of December 1840 execute a bond * * * conditioned, also, that he will well and truly manufacture salt at the said saline works and at all times, (unavoidable accidents not preventing), keep a sufficient quantity of salt on hand to supply all such persons of the neighboring country as purchase salt at said saline for domestic consumption whenever they shall apply at the work for the same; and conditioned, also, that he will at no time during his said lease charge or receive more than 62½¢ per bushel for said salt so manufactured; and conditioned, also, further, that he shall deliver at the end of the said ten years the said wells and the line of pipes in as good condition as they now are, without let or delay; and also, with the further condition, that he shall at no time, during the said lease enter into any scheme or bargain whereby the manufacture of salt shall be suspended or a monopoly accrue to the prejudice of any of the people of this state.

* * * * *

JACKSON COUNTY SALINE.

LAWS 1840-41, P. 292.

FEBRUARY 26, 1841.

AN ACT to provide for leasing the Saline Reserve Land in Jackson County and for granting the preemption to certain persons therein named.

SEC. 1. Be it enacted, etc.: That David Halliday of Jackson County be and he is hereby appointed commissioner of the "Muddy Saline" in the aforesaid County of Jackson, to sell and dispose of a portion and to lease the residue of the lands in the saline reserve in the said county as hereinafter provided; and the said commissioner shall on or before the first day of May next enter into a bond, * * *

SEC. 2. The said commissioner, shall as soon as may be, have the said saline reserve lands subdivided by accurate survey into lots of suitable size not exceeding in any case forty acres; and shall cause to be made out from such survey a map or plat of such reserve, noting thereon the section contained and range of said lands, designate the said lots by number on the said plat, the said commissioner shall acknowledge and cause to be recorded in the record book of the recorder of the aforesaid county: Provided that the lot on which the salt well is situated shall not contain more than ten acres of land and that the said salt well shall be as near as practicable to the center of said lot.

* * * * *

SEC. 5. That if any person or persons shall be desirous to engage in any new discovery of salt water on said Big Muddy Reserve, it shall be the duty of said commissioner to authorize such person or persons to undertake the same, who, on making such discovery, shall be entitled under the provisions of this act to all the use, benefit and profits of such discovery in the manufactory of salt, free of charge or lease, for a term of ten years; at the end of which term such person or persons making such discovery shall surrender to the state all ip-

terest and concern in such manufactory of salt that the said state could rightfully be entitled to expect as hereinafter provided by law.

SEC. 6. All timber or as much thereof as may be necessary with such other privileges and immunities as may belong to said reserve are hereby declared to be for the benefit of such lessee or lessees as may undertake the manufactory of salt, under the provisions of this act or to any person or persons who may engage in the discovery of salt water. * * *

GALLATIN COUNTY SALINE.

LAWS 1840-41, P. 294.

FEBRUARY 27, 1841.

AN ACT to amend an act entitled "An act relating to the Gallatin Salines and the lands belonging to the same," approved January 26 (18), A. D. 1836.

SEC. 1. Be it enacted, etc.: That William J. Gatewood of the County of Gallatin is hereby appointed commissioner for the purpose of carrying out the provisions of the act to which this is an amendment as well as the provisions of such acts in relation to the Gallatin Saline as are still in force and unrepealed.

SEC. 2. Said commissioner shall proceed to sell the lands belonging to said saline either at public sale, by giving previous public notice of the same, or by private entry, if it be more eligible, reserving whenever unsold, all salt water wells with the saline lots belonging to them, as well (as) the common attached to said lot.

SEC. 3. Said commissioner is hereby vested with full power to demand, sue for and recover all money due the state for the rents or sales of said salines or from commissioners or agents hereafter employed in relation to the same; and he is hereby required to proceed to recover all debts due to the state, on account of said salines for the purpose of making a final settlement of this matter. * * *

* * * * *

SALE OF GALLATIN COUNTY SALINE RESERVE.

LAWS 1846-7, P. 114.

FEBRUARY 23, 1847.

AN ACT to authorize the Governor of this State to sell the salt wells and coal lands in the Saline Reserve, in Gallatin county, for State indebtedness, and for other purposes.

SECTION 1. Be it enacted, etc.: That it shall be the duty of the Governor of this State to cause to be sold at public auction, in Equality, in this State, to the highest bidder, for internal improvement bonds, or railroad scrip, (excluding the Macalister and Stebbins' bonds,) issued by authority of this State, all the salt wells, coal lands, and other lands in the Gallatin county "Saline reserve," not heretofore disposed of; and to make and execute proper and sufficient patents or deeds of conveyance to the purchaser or purchasers thereof: Provided, that he shall give notice of such sale for three months previous thereto in some public newspaper or newspapers in this State, and, also, in Pittsburg, Charlestown, Kanawha county, Virginia, Cincinnati, and Louisville: Provided, also, before said sale shall be advertised, the present lessee or lessees of said salt wells, and other lands, shall file their written surrender of their leases in the office of the auditor of this State, for the time unexpired since the first day of December last, from which time the said lessee or lessees shall be exonerated from the payment or rent by their bond or bonds subsequently accruing.

SEC. 2. Said salt wells, and lots connected therewith, and said coal lands and other lands belonging to the State within said reserve, shall be appraised by

commissioners to be appointed by the Governor, not exceeding three in number, who shall take an oath faithfully to value and appraise the said wells and lands in such State indebtedness, and to make a return thereof to the auctioneer or agent appointed by the Governor to sell the same, which shall be regarded as the minimum price of said wells and lands, below which they shall not be sold.

SEC. 3. The line of pipes and other fixtures belonging to the State, of whatever kind or description, shall, also, be appraised and sold as aforesaid.

SEC. 4. The wells and the lots set apart for the use of the same, the coal lands or lots, and the other lands owned by the State in the said "Saline reserve," shall be offered for sale and sold separately: Provided, that it shall be lawful to sell the pipes and other fixtures in connection with such well, or wells, or well lots, with which they may most properly and conveniently connect.

SEC. 5. That the school trustees of township number nine south, in range seven east, in consideration that the school section in said township was sold by the State as a part of the "Saline reserve," whereby said township possesses no school lands or township school fund whatever, shall be allowed to purchase at such sale, salt wells, coal lands, or other lands or property hereby authorized to be sold, to the value of one section of land, at Congress price, and the school trustees of township number nine south, in range number eight east, (which school section was also sold by the State as a part of the "Saline reserve," whereby the said last township possesses no school funds or township school fund whatever, except a half section granted to it by the State,) shall also be allowed to purchase at such sale such lands, or wells, or property, to the value of one half section of land, at Congress price. The Governor shall convey the same, without further consideration, to the trustees of said townships respectively, for the use of the inhabitants thereof, for the use of schools forever, and the same shall be held, and may be sold, or otherwise disposed of, like other school lands in this State.

SEC. 6. The agent to be appointed by the Governor under this act shall make return to the auditor of State of all his proceedings under this act, and shall grant certificates of purchase for each tract of land, etc., sold, which shall be sufficient evidence of purchase until patents are issued therefor.

SEC. 7. The Governor shall pay the expenses of carrying out the provisions of this act out of the contingent fund placed at his disposal by law.

SHOT FIRERS.

SHOT FIRERS—OPERATORS TO FURNISH.

FOR ANNOTATIONS SEE PAGE 303.

LAW 1905, P. 323.

MAY 18, 1905.

AN ACT providing that operators of mines shall furnish shot firers in mines where shooting and blasting is (are) done.

SECTION 1. Be it enacted, etc.: In all mines in this State where coal is blasted, and where more than two pounds of powder is used for any one blast; and, also, in all mines in this State where gas is generated in dangerous quantities, a sufficient number of practical, experienced men, to be designated as shot firers, shall be employed by the company, and at its expense, whose duty it shall be to inspect and do all the firing of all blasts, prepared in a practical, workmanlike manner in said mine or mines.

SEC. 2. That shot firers shall, immediately after the completion of their work, post a notice in a conspicuous place at the mine, in which shall be indicated the number of shots fired; also the number of shots they did not fire, if any, specifying the number of the room and designation of the entry, and giving reasons for not firing same. In addition they shall also keep a daily permanent record in which shall be entered the number of shots or blasts fired, the number of shots or blasts failing to explode, and the number of shots or blasts that in their judgment were not properly prepared and which they refused to fire, giving reasons for same; the record to be in the custody of the mine manager and to be available for inspection at all times by parties interested.

SEC. 3. The superintendent or mine manager shall not permit the shot firers to do any blasting, exploding of blasts, or to do any firing whatever, until each and every miner and employe is out of the mine except the shot firers.

SEC. 4. Any wilful neglect, refusal or failure to do the things required to be done by any section, clause or provision of this act on the part of the person or persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any person in the discharge of the duties herein imposed upon them, or any refusal to comply with the provisions of this act, shall be deemed a misdemeanor, punishable by a fine not less than one hundred dollars, and not to exceed two hundred dollars, or by imprisonment in the county jail for a period not exceeding three months, or both, at the discretion of the court: Provided, that whoever shall discover that any section of this act, or part thereof, is being neglected or violated shall report same to the superintendent of the mines and ask immediate compliance therewith; and in the case of continued failure to comply shall, through the State's attorney, or any other attorney in case of his failure to act promptly, take the necessary legal steps to enforce compliance therewith through the penalties herein prescribed. (Amended. See following Act.)

DUTIES OF SHOT FIRERS—FIRST AMENDATORY ACT.

LAWS 1907, P. 401.

MAY 20, 1907.

AN ACT to amend an Act entitled "An Act providing that operators of mines shall furnish shot firers in mines where shooting and blasting is done," approved May 18, 1905, in force July 1, 1905.

SECTION 1. Be it enacted, etc.: That an Act entitled "An Act providing that operators of mines shall furnish shot firers in mines where shooting and blasting is done," approved May 18, 1905, in force July 1, 1905, be and the same is amended to read as follows:

SEC. 2. In all mines in this State where coal is blasted, and where not more than two pounds of powder is used for any one blast; and also, in all mines in this State where gas is generated in dangerous quantities, a sufficient number of practical, experienced men to be designated as shot firers, shall be employed by the company and at its expense, whose duty it shall be to inspect and do all the firing of all blasts prepared in a practical, workmanlike manner in said mine or mines.

SEC. 3. The shot firers shall, immediately after the completion of their work, post a notice in a conspicuous place at the mine, in which shall be indicated the number of shots fired; also the number of shots they did not fire, if any, specifying the number of the room and designation of the entry, and giving reasons for not firing the same. In addition they shall also keep a daily permanent record in which shall be entered the number of shots or blasts fired, the number of shots or blasts failing to explode, and the number of shots or blasts that in their judgment were not properly prepared and which they refuse to fire, giving reasons for the same, the record to be in the custody of the mine manager and to be available for inspection at all times by parties interested.

SEC. 4. The superintendent or mine manager shall not permit the shot firers to do any blasting, exploding of shots, or do any firing whatever until each and every miner and employé is out of the mine except the shot firers, mine superintendent, mine manager and man or men necessarily engaged in charge of the pumps and stables: Provided, however, that nothing in this section shall be construed to prohibit the employment in such mine of a reasonably necessary number of men during such time for the purpose of securing the workings in case of fire therein.

SEC. 5. No miner or other person shall alter or change any drill hole, by increasing its depth, diameter or otherwise, after the same shall been approved by the shot firer.

SEC. 6. No shot firer, whether voluntarily, or by command or request of any person, shall fire any unlawful shot, or any shot which in his judgment, exercised as aforesaid, from his inspection thereof, made as aforesaid, shall not be a workmanlike, proper and practical shot.

SEC. 7. No person or persons shall order, command or induce by threats, or otherwise, any shot firer to fire any unlawful shot, or any shot which in his judgment, after due inspection, shall not be a workmanlike, proper and practical shot.

SEC. 8. Any wilful neglect, refusal or failure to do the things required to be done by any section, clause or provision of this Act on the part of the person or persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any person in the discharge of the duties herein imposed upon them, or any refusal to comply with the provisions of this Act, shall be deemed a misdemeanor, punishable by a fine of not less than one hundred dollars and not to exceed two

hundred dollars, or by imprisonment in the county jail for a period not exceeding three months, or both, at the discretion of the court: Provided, that whoever shall discover that any section of this Act, or part thereof, is being neglected or violated shall report the same to the superintendent of the mines and ask immediate compliance therewith; and in case of continued failure to comply shall, through the State's attorney, or any other attorney, in case of his failure to act promptly, take the necessary legal steps to enforce compliance herewith, through and by means of the penalties herein prescribed.

DUTIES OF SHOT FIRERS—SECOND AMENDATORY ACT.

LAWS 1912, P. 442.

JUNE 27, 1912.

AN ACT to amend sections 2 and 7 of an Act entitled "An Act providing that operators of mines shall furnish shot firers in mines where shooting and blasting is done," approved May 18, 1905, in force July 1, 1905, as amended by Act approved May 20, 1907, in force July 1, 1907.

SECTION 1. Be it enacted, etc.: That sections 2 and 7 of an Act entitled "An Act providing that operators of mines shall furnish shot firers in mines where shooting and blasting is done," approved May 18, 1905, in force July 1, 1905, as amended by Act approved May 20, 1907, in force July 1, 1907, be and the same are hereby amended so as to read as follows:

SEC. 2. In all mines in this State where coal is blasted, and where more than two pounds of powder are used for any one blast; and, also, in all mines in this State where gas is generated in dangerous quantities, a sufficient number of practical, experienced miners, to be designated as shot firers, shall be employed by the company, and at its expense, whose duty it shall be to inspect and do all the firing of all blasts, prepared in a practical, workmanlike manner in said mine or mines.

SEC. 7. No person or persons shall order, command or induce by threat or otherwise, any shot firer to fire any unlawful shot, or any shot which in his judgment, after due inspection, shall not be a workmanlike, proper and practical shot.

No person shall drill or shoot a dead hole as hereinafter defined. A "dead hole" is a hole where the width of the shot at the point measured at right angles to the line of the hole is so great that the heel is not of sufficient strength to at least balance the resistance at the point. The heel means that part of the shot which lies outside of the powder.

ANNOTATIONS.

1. SHOT-FIRERS' ACT—NATURE AND VALIDITY.
2. SHOT FIRERS PROTECTED.
3. PURPOSE AND CONSTRUCTION OF AMENDATORY ACT.
4. ACTIONS FOR INJURIES OR DEATH.

1. SHOT-FIRERS' ACT—NATURE AND VALIDITY.

The act known as "shotfirers' act" is valid as covering the subject with which it purports to deal. The penalties provided by section 33 of the general act of 1899 relating to mines and miners can not be applied in case of violations of the shot-firers' act.

Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, p. 106.

This act known as the "shot-firers' act" is no part of the general mines and miners' act. It can not be regarded as an amendment of the general act of 1899 relating to mines and miners, as it is not a compliance with the statu-

tory provision necessary to make it amendatory of that act. It does relate to matters which might properly have been included in the act of 1899 which permitted miners, workmen, or shot firers to explode shots under the conditions provided therein.

Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, p. 104;
Houglan v. Avery Coal & Mining Co., 246 Ill. 609, p. 615.
See Kulvie v. Bunsen Coal Co., 253 Ill. 286.

By the act of 1905 the legislature has made it necessary for a mine operator to further classify his employees for the service heretofore required of the miner, that of shot firing. It is now the duty of the mine operator to employ a sufficient number of practically experienced men whose duties are to inspect and do all the firing of all blasts prepared in a practical, workmanlike manner. Shot firers are thus made a distinct class, experts as it were, and no more to be classed as miners within the meaning of the acts of 1879 and 1899.

Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239, p. 242.

2. SHOT FIRERS PROTECTED.

Shot firers employed under the authority of this act come within the protection of the general mining statute, and are entitled to recovery for injuries caused by the violation of the statute by the mine operator.

Stevenson v. Avery Coal & Min. Co., 148 Ill. App. 397, p. 399;
Stevenson v. Avery Coal & Min. Co., 152 Ill. App. 565, p. 571;
Davis v. Illinois Collieries Co., 232 Ill. 284, p. 290.

The provisions of section 16 (d) and section 20 (e) of the mines and miners' act (1899) apply only where the miners do their own firing, and have no application to shot firers employed and installed under this act.

Illinois Collieries Co. v. Davis, 137 Ill. App. 15, p. 20.

3. PURPOSE AND CONSTRUCTION OF AMENDATORY ACT.

The act of 1907 is an amendment of the shot-firers' act of 1905, and requires a sufficient number of practical, experienced men, to be designated as shot firers, to be employed in certain classes of mines, and whose duty it should be to instruct and do all the firing of all blasts prepared in the mine. Under this act the shot firer is to determine for himself whether the shot is prepared in a practical and workmanlike manner, and his judgment is conclusive on this question.

Kulvie v. Bunsen Coal Co., 253 Ill. 386, p. 388.

4. ACTIONS FOR INJURIES OR DEATH.

In an action for the death of a shot firer caused by an explosion due to an accumulation of gas and inflammable elements, a statement of the mine examiner as to the quantity of gas in the entry, made at a time when he was not there in the discharge of his duty, is not admissible in evidence, as such a statement is the mere declaration of an agent when not in the discharge of an act or duty he was authorized to do, and is therefore not admissible as a part of the *res gestae*.

Conover v. Harrisburg & Southern Coal Co., 161 Ill. App. 74, p. 77.

In an action for the death of a shot firer on the ground of the alleged violation of the statute by the mine operator, on account of his willful failure to have the entries, rooms, and galleries examined and the dangerous places

marked, in that dust, smoke, gas, and deleterious air accumulated in the mine, causing an explosion that resulted in the death of a shot firer, it is improper to admit evidence as to the condition of the entry and the accumulation of dust in the entry where the explosion occurred several days afterwards, where there was no evidence to show that conditions were the same as at the time of the explosion.

Conover v. Harrisburg & Southern Coal Co., 161 Ill. App. 74, p. 77.

In an action for the death of a shot firer caused by an explosion due to improper ventilation causing the accumulation of dust, gas, and other inflammable elements, it is proper to show that the entry and rooms where the explosion occurred were dusty and dry and a bad condition of the air current two or three days prior to the explosion. Such evidence tends to show conditions as to dust at the time of the explosion and to show notice to the mine operator of the dusty condition, and therefore a conscious violation of the statute.

Turner v. Manufacturers & Consumers Coal Co., 161 Ill. App. 534, p. 538.

In an action by a shot firer against a mine operator for damages for injuries resulting from a shot alleged to be caused by the failure of the operator to comply with the statute in failing to keep clear and in failing to see that a crosscut afforded the miner an unobstructed means of escape, a recovery can not be defeated on the ground that a shot firer himself wrongfully and unlawfully fired the shot that caused the injury.

Tomasi v. Donk Bros. Coal & Coke Co., 257 Ill. 70, p. 73.

See *Davis v. Illinois Collieries Co.*, 232 Ill. 284;

Brunnworth v. Kerens-Donnewald Coal Co., 20 Ill. 211;

Tomasi v. Donk Bros. Coal & Coke Co., 160 Ill. App. 47, p. 50.

TAXATION.

REAL PROPERTY AND CORPORATE STOCKS.

LAWS 1871-72, 1, PP. 8, 11.

MARCH 30, 1872.

AN ACT for the assessment of property and for the levy and collection of taxes.

SECTION 1. Be it enacted, etc.: That the property named in this section shall be assessed and taxed, except so much thereof as may be, in this act, exempted:

* * * * *

SEC. 4. RULES FOR VALUING REAL ESTATE. Real property shall be valued as follows:

* * * * *

Fourth. In valuing any real property on which there is a coal or other mine, or stone or other quarry, the same shall be valued at such a price as such property, including the mine or quarry, would sell at a fair, voluntary sale for cash.

* * * * *

SEC. 32. Banking, bridge, express, ferry, gravel road, gas, insurance, manufacturing, mining, * * * and all other companies and associations incorporated under the laws of this state (other than banks organized under the general banking laws of this state), shall, in addition to the other property required by this act to be listed, make out and deliver to the assessor a sworn statement of the amount of its capital stock, setting forth particularly—

First. The name and location of the company or association.

Second. The amount of capital stock authorized, and the number of shares into which such capital stock is divided.

Third. The amount of capital stock paid up.

Fourth. The market value, or if no market value, then the actual value of the shares of stock.

Fifth. The total amount of all indebtedness except the indebtedness for current expenses—excluding from such expenses the amount paid for the purchase or improvement of property.

Sixth. The assessed valuation of all its tangible property. Such schedule shall be made in conformity to such instructions and forms as may be prescribed by the auditor of public accounts. In all cases of failure or refusal of any person, officer, company or association to make such return or statement, it shall be the duty of the assessor to make such return or statement from the best information which he can obtain.

* * * * *

FIRST AMENDATORY ACT.

LAWS 1879, P. 251.

MAY 13, 1879.

AN ACT to amend sections three (3) and thirty-two (32) of an act entitled "An act for the assessment of property, and for the levy and collection of taxes," approved March 30, 1872.

SECTION 1. Be it enacted, etc.: That section three (3) of an act entitled "An act for the assessment of property, and the levy and collection of taxes, approved March 30, 1872; in force July 1, 1872, be, and the same is, hereby so amended as to read as follows:

SEC. 2. That the thirty-second (32) section of said act is hereby so amended as to read as follows:

SEC. 32. Rules for listing and valuing property of banking and other corporations. Banking, bridge, express, ferry, gravel road, gas, insurance, mining, * * * and all other companies and associations incorporated under the laws of this State * * * shall in addition to the other property required by this act to be listed, make out and deliver to the assessor a sworn statement of the amount of its capital stock, setting forth particularly.

First. The name and location of the company or association.

Second. The amount of capital stock authorized, and the number of shares into which such capital stock is divided.

Third. The amount of capital stock paid up.

Fourth. The market value, or if no market value, then the actual value of the shares of stock.

Fifth. The total amount of all indebtedness, except the indebtedness for current expenses, excluding from such expenses the amount paid for the purchase or improvement of property.

Sixth. The assessed valuation of all its tangible property, such schedule shall be made in conformity to such instruction and forms as may be prescribed by the Auditor of Public Accounts. In all cases of failure or refusal of any person, officer, company or association to make such return or statement, it shall be the duty of the assessor to make such return or statement from the best information which he can obtain.

SECOND AMENDATORY ACT.

LAWS 1893, P. 172.

JUNE 19, 1893.

AN ACT to amend sections 3 and 32 of an act entitled "An act," etc. (as in section 1).

SECTION 1. Be it enacted, etc.: That sections 3 and 32 of an act for the assessment of property for the levy and collection of taxes, approved March 30, 1872, in force July 1, 1872, as amended by an act approved May 13, 1879, in force July 1, 1879, be amended to read as follows:

SECTION 3. Personal property shall be valued as follows:

Fourth. * * * Provided, further, that companies and associations organized for purely manufacturing purposes or for the mining and sale of coal, * * * shall be assessed by the local assessors in like manner as the property of individuals is required to be assessed.

SECTION 32. Bridges, express, ferry, gravel road, gas, insurance, mining, * * * and all other companies and associations incorporated under the laws of this State, other than banks organized under any special or general law of this State, and the corporations required to be assessed by the local assessors, as hereinbefore provided, shall, in addition to the other property required by

this act to be listed, make out and deliver to the assessor a sworn statement of the amount of its capital stock, setting forth particularly :

* * * * *

(Paragraphs 1-6 same as original and not changed by amendments.)

Whereas, Assessments are required to be made prior to July 1, 1893, therefor[e] an emergency exists, and this act shall take effect and be in force from and after its passage.

THIRD AMENDATORY ACT.

LAW 1906, P. 333.

MAY 18, 1906.

AN ACT to amend sections 1, 3, 32, and 108 of an act entitled "An act for the assessment of property and for the levy and collection of taxes," approved March 30, 1872, in force July 1, 1872, as heretofore amended.

SECTION 1. Be it enacted, etc.: That sections 1, 3, 32, and 108 of an act entitled "An Act for the assessment of property and for the levy and collection of taxes," approved March 30, 1872, as heretofore amended, be, and the same are hereby amended so that the same shall read as follows:

SECTION 1. That the property named in this section shall be assessed and taxed except so much thereof as may be in this act exempted:

* * * * *

Fourth. The capital stock of companies and associations incorporated under the laws of this State, except companies and associations organized for purely manufacturing and mercantile purposes, or for either of such purposes, or for the mining and sale of coal. * * *

NOTE.—The original acts of which this is amendatory made no reference to mining and sale of coal.

SEC. 3. Personal property shall be valued as follows:

* * * * *

Fourth. The capital stock of all companies and associations now or hereafter created under the laws of this State, except companies and associations organized for purely manufacturing and mercantile purposes or for either of such purposes, or for the mining and sale of coal, * * * shall be so valued by the State Board of Equalization as to ascertain and determine, respectively, the fair cash value of such capital stock, including the franchise over and above the assessed value of the tangible property of such company or association, such board shall adopt such rules and principles for ascertaining the fair cash value of such capital stock as to it may seem equitable and just, and such rules and principles when so adopted, if not inconsistent with this act, shall be as binding and of the same effect as if contained in this act, subject, however, to such change, alteration or amendment as may be found from time to time, to be necessary by said board: Provided, that in all cases where the tangible property or capital stock of any company or association is assessed under this act, the shares of capital stock of such company or association shall not be assessed or taxed in this State. This clause shall not apply to the capital stock, or shares of capital stock of banks organized under the general banking laws of this State or under any special charter heretofore granted by the Legislature of this State.

SEC. 32. Bridges, express, ferry, gravel road, gas, insurance, mining, * * * and all other companies and associations incorporated under the laws of this State other than * * * companies and associations organized for purely manufacturing and mercantile purposes, or for either of such purposes, or for the mining and sale of coal, * * * shall in addition to the other

property required by this act to be listed, make out and deliver to the assessor a sworn statement of the amount of its capital stock, setting forth particularly:

First. (Clauses first-sixth, same as in Laws 1879) Page 382.

SEC. 108. The State Board of Equalization shall assess the capital stock of each company or association respectively now or hereafter incorporated under the laws of this State and which by this act are expressly required to be assessed by the State Board of Equalization in the manner hereinbefore in this act provided. But the State Board of Equalization shall not assess the capital stock of companies and associations organized for purely manufacturing and mercantile purposes or for either of such purposes, or for the mining and sale of coal. * * * The respective assessments so made (other than of the capital stock of railroad and telegraph companies) shall be certified by the Auditor, under direction of said board, to the county clerk of the respective counties in which such companies or associations are located, and said clerk shall extend the taxes for all purposes on the respective amounts so certified the same as may be levied on the other property in such towns, districts, villages or cities in which such companies or associations are located.

NOTE.—See Mining rights—Conveyance. Page 343.

WEIGHING COAL.

WEIGHT OF BUSHEL.

LAWS 1946-7, P. 168.

FEBRUARY 18, 1947.

AN ACT to fix the standard weight of coal.

SECTION 1. Be it enacted, etc.: That whenever mineral coal shall be sold by the bushel within the limits of this State, and no special agreement as to the weight or measurement shall be made by the parties, the bushel shall consist of eighty pounds, and this shall be the standard weight of a bushel of coal.

SEC. 2. This act to be in force from and after its passage.

WEIGHT OF BUSHEL.

LAWS 1855, P. 176.

FEBRUARY 14, 1855.

AN ACT to amend an act concerning weights and measures.

SECTION 1. Be it enacted, etc.: That whenever any of the following articles shall be contracted for, or sold, or delivered, and no special contract or agreement shall be made to the contrary, the weight per bushel shall be as follows, to wit: * * * stone coal, eighty (80) pounds * * *.

SEC. 2. All laws and parts of laws inconsistent with this act are hereby repealed.

NOTE.—The prior acts of which this is amendatory made no reference to coal. Subsequent amendatory acts make additions but no change as to coal.

WEIGHT OF BUSHEL.

ACT OF 1855 CODIFIED.

REVISED STATUTES (HURD), 1874, P. 1098.

FEBRUARY 27, 1874.

AN ACT to revise the law in relation to weights and measures.

SEC. 1. STANDARD.—Be it enacted, etc.: That the weights and measures received from the United States, and now in charge of the secretary of state, to-wit:

* * * * *

SEC. 7. WEIGHTS PER BUSHEL.—Whenever any of the following articles shall be contracted for, or sold or delivered, and no special contract or agreement shall be made to the contrary, the weight per bushel shall be as follows, to-wit: Stone coal, 80 pounds.

* * * * *

WEIGHING COAL AT MINES.

LAWS 1882, P. 112.

JUNE 14, 1882.

AN ACT to provide for the weighing of coal at the mines.

SECTION 1. Be it enacted, etc.: That the owner, agent or operator of each and every coal mine or colliery in this State shall furnish, or cause to be furnished, and placed upon the switch or railroad track adjacent to said coal mine or colliery, a "track scale" of standard manufacture, and shall weigh all coal hoisted from said mine or colliery before or at the time of being loaded on cars, wagons, or other vehicle of transportation: Provided, that in cases where track scales can not be used, or the product of such mine or colliery will not justify the expense of a track scale, the owner, agent or operator of same shall be permitted to furnish (in lieu of a track scale) a platform scale of sufficient capacity to weigh each box as it is hoisted from such mine or colliery.

SEC. 2. All coal produced in this State shall be weighed on the scales as above provided; and the weight so determined shall be considered the basis upon which the wages of persons mining said coal shall be computed.

SEC. 3. It shall be lawful for the miners employed in any coal mine or colliery in this State, to furnish a check weigher at their own expense, whose duty it shall be to balance said scales and see that the coal is properly weighed, and keep a correct account of same, and for this purpose he shall have access at all times to the "beam box" of said scale while such weighing is being performed. That the agent employed by persons mining coal, to act as check weighman, shall be an employe in the mines where the coal to be weighed was produced, (and) a citizen of the State and county wherein the mine is situated. He shall, on application to the owner, agent or operator of the mine producing the coal to be weighed, be furnished with a written permit, that shall entitle him to enter and remain in the room or place where the accounting by him of the weights of coal is to be done, and the said permit shall not be transferable: Provided, that the provisions of this act shall apply only to coal miners doing business on and shipping coal by railroad or by water.

SEC. 4. Any person, owner or agent, operating a coal mine or colliery in this State, who shall fail to comply with the provisions of this act, or any person who shall obstruct or hinder the carrying out of its requirements, shall be deemed guilty of a misdemeanor, and punished accordingly.

ANNOTATIONS.

1. VALIDITY OF STATUTE.
2. CONSTRUCTION AND PURPOSE OF STATUTE.
3. WEIGHT OF COAL AS BASIS OF WAGES.
4. FAILURE TO COMPLY—DEFENSE.

1. VALIDITY OF STATUTE.

This statute does not offend against the Constitution on the ground that in effect it deprives coal operators of the State of the power to make contracts to have coal mined except the wages of the persons mining coal be computed on the weight of the coal mined. It is not objectionable on the ground that mine operators are deprived of their property without due process of law.

Jones v. People, 110 Ill. 590, p. 593;

Millet v. People, 117 Ill. 294, p. 298;

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 55.

See Reinecke v. People, 15 Ill. App. 241.

2. CONSTRUCTION AND PURPOSE OF STATUTE.

This is a penal statute and is to be construed strictly, and is neither to be extended by mere implication to either persons or things not brought within its provisions within the clear meaning and intent.

Reinecke v. People, 15 Ill. App. 241, p. 244.

The reason of this enactment and the intent of the legislature is that the coal mined should be weighed, and the weight having been so determined, that weight should be considered the basis upon which the wages of persons mining the coal shall be computed and paid. The general assembly evidently considered that some wrong had been or might be done to persons mining the coal when the weight of the coal is taken as a basis of the payment for services rendered, and as a remedy for that wrong, either existing or in anticipation, the legislature provided for "track scales." This intent is further shown by the provision that the miners may select one of their own number as an "agent weigher," who may be present when the coal is weighed.

Reinecke v. People, 15, Ill. App. 241, p. 245.

3. WEIGHT OF COAL AS BASIS OF WAGES.

From all sections of the statute considered together, the purpose of the act appears to be for the protection of miners who are paid according to the weight of coal dug, the intention being to provide a correct basis in the determining of the weight upon which the wages of miners should be computed. The act does not apply where a contract is for the paying of wages in some other way than according to the weight of coal dug.

Jones v. People, 110 Ill. 590, p. 593.

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54.

See *Reinecke v. People*, 15 Ill. App. 241.

The legislature intends the act to apply only to mines where the weight of the coal mined is taken as the basis for compensation to the miners. A court will not presume that the legislature intended that the operator of a coal mine should expend a thousand dollars for a "track scale" when not a person in the mine was interested in the weight of the coal mined. Neither was it intended that the coal miners at their own expense should employ one of their number to be present when the coal was weighed, keeping an account of the coal if the quantity of coal mined was wholly immaterial to them.

Reinecke v. People, 15 Ill. App. 241, p. 246.

Section 2 provides that the weight determined by weighing on the scales furnished shall be considered the basis upon which the wages of persons mining coal shall be computed, but this does not require that in all contracts for the mining of coal the wages of miners must be computed upon the basis of the weight of the coal mined. Such a provision would be arbitrary and would be an undue interference with the right of making contracts.

Jones v. People, 110 Ill. 590, p. 594;

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 55.

See *Reinecke v. People*, 15 Ill. App. 241.

4. FAILURE TO COMPLY—DEFENSE.

In a trial on an indictment against a defendant as operator of a coal mine for failure to put in scales as required by the statute the defendant may show as a defense that at and before the time the act took effect the corporation operating the coal mine had a contract with all the men employed to mine coal during

the period to receive as wages for their labor the sum of 40 cents per box for each box of coal mined and taken from the mine; that all persons employed by the mining company had always been and were then satisfied to work under such contract, and they did not desire the coal mined by them and taken from the mine to be weighed as a basis upon which to compute their wages, and they did not want to furnish a check weigher at their own expense to weigh the coal mined by them.

Jones v. People, 113 Ill. 584, p. 587;

Millet v. People, 117 Ill. 294, p. 298.

See Reinecke v. People, 15 Ill. App. 241.

WEIGHING COAL AT MINES—AMENDATORY ACT.

LAWS 1885, P. 221.

JUNE 20, 1885.

AN ACT to amend sections 2, 3 and 4 of an act entitled "An act to provide for the weighing of coal at the mines," approved June 14, 1883, in force July 1, 1883.

SECTION 1. Be it enacted, etc.: That sections 2, 3, and 4 of an act entitled "An act to provide for the weighing of coal at the mines," approved June 14, 1883, in force July 1, 1883, be amended so as to read as follows:

SEC. 2. All coal produced in this State shall be weighed on the scales as above provided, and a correct record kept of same in a well bound book furnished by the owner, agent or operator of such mine for that purpose, by a competent person, at the expense of such owner, agent or operator, said record to be subject to the inspection (at all reasonable business hours) of the miner, operator, carrier, land owner, adjacent land owner, members of the Bureau of Labor Statistics, mine inspectors and all others interested. The party weighing the coal and keeping such record shall be required, before entering upon his duties, to make and subscribe to an affidavit before some magistrate, or other officer authorized to administer oaths under the statute, to accurately weigh and faithfully keep a true record of all coal hoisted from such shaft; such affidavit to be placed on file with the mine inspector of his county or district, and any one knowingly or wilfully disregarding such oath or affidavit shall be regarded as a perjurer and punished accordingly.

SEC. 3. It shall be lawful for the miners employed in any coal mine or colliery in this State to furnish a check-weigher at their own expense, whose duty it shall be to balance said scales and see that the coal is properly weighed and keep a correct account of same, and for this purpose he shall have access at all times to the beam-box of said scale while such weighing is being performed. That the agent employed by persons mining coal to act as such check-weigher shall be a citizen of the State and county wherein the mine is situated, and shall, before entering upon his duties, make and subscribe to an affidavit, same as set forth in section 2 of this act, and shall be subject to the same penalty. He shall, on application to the owner, agent or operator of the mine producing the coal to be weighed, be furnished with a written permit that shall entitle him to enter and remain in the room or place where the accounting by him of the weights of coal is to be done, and the said permit shall not be transferable.

SEC. 4. Any person, owner or agent operating a coal mine or colliery in this State, who shall fail to comply with the provisions of this act, or any person who shall obstruct or hinder the carrying out of its requirements, shall be fined for the first offense not less than fifty (50) dollars; for the second offense not less than two hundred (200) dollars, and for the third offense not less than five hundred (500) dollars, or be imprisoned in the county jail not less than six months: Provided, that the provisions of this act shall apply only to coal mines doing business on, and shipping coal by railroad or by water.

SEC. 5. That all contracts for the mining of coal, in which the weighing of the coal as provided for in this act shall be dispensed with, shall be null and void.

ANNOTATIONS.

VALIDITY OF STATUTE.

The statute of June 29, 1885, requiring a coal-mine operator to furnish and place upon the tracks adjacent to his mine a track scale, and requiring that all coal produced should be weighed, and declaring all contracts for mining of coal in which the weighing of coal should be dispensed with should be null and void, is invalid and unconstitutional. It is not within the power of the legislature to compel a mine operator to pay miners solely by the weight of coal mined.

Millett v. People, 117 Ill. 94, p. 308;

Ramsey v. People, 142 Ill. 380, p. 386;

Braceville Coal Co. v. People, 147 Ill. 66, p. 72;

Harding v. People, 160 Ill. 459, p. 464.

The mining of coal is not affected with a public use and therefore specially regulated by law, like the business of an innkeeper, common carriers, millers, and other lines of business. The public are not compelled to resort to mine owners any more than they are compelled to resort to the owners of wood or turf or to the owners of grain, domestic animals, or to those owning any of the ordinary necessities or conveniences of life which are a part of the commerce of the country. The owner of a coal mine is under no obligation to obtain a license from any public authority, and he exercises no franchise when he chooses to mine his coal. The general assembly has no power to deny to persons in one line of business the privilege to contract for labor and to sell their products without regard to weight, while at the same time allowing to persons in all other lines of business this privilege, there being nothing in the business itself to distinguish it from any other kind of business. The owner or operator of a coal mine who shall contract for the mining of coal or the selling of coal by weight may by statute be required to procure scales for the weighing of coal. But the legislature can not compel a coal-mine operator to make all his contracts with reference to the mining and handling of the coal to be regulated by weight, and he can not by statute be compelled to buy and keep and use scales when he has no necessity for their use. The provisions of the act of 1885 do not relate to the safety or health of the miners, and are not a police regulation to promote that end, and it is in violation of the constitution.

Millet v. People, 117 Ill. 294, p. 308;

Ramsey v. People, 142 Ill. 380, p. 386;

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54.

WEIGHING COAL AT MINES—REPEALING ACT.

LAW 1887, P. 235.

JUNE 17, 1887.

AN ACT to provide for the weighing of coal at the mines, and to repeal a certain act therein named.

SECTION 1. Be it enacted, etc.: That the owner, agent or operator of every coal mine in this State at which the miners are paid by weight, shall provide at such mines suitable and accurate scales of standard manufacture, for the weighing of all coal, which shall be hoisted or delivered from such mines.

SEC. 2. (a) All coal so delivered from such mines shall be carefully weighed upon the scales as above provided, and a correct record shall be kept of the weight of each miner's car, which record shall be kept open at all reasonable hours for the inspection of all miners or others peculiarly interested in the product of such mine.

(b) The person designated and authorized to weigh the coal and keep such record shall, before entering upon his duties, make and subscribe to an oath before some magistrate or other officer authorized to administer oaths, that he will accurately weigh and carefully keep a true record of all coal delivered from such mine, and such oath shall be kept conspicuously posted at the place of weighing.

SEC. 3. (a) It shall be lawful for the miners employed in any coal mine in this State to furnish a check-weighman at their own expense whose duty it shall be to balance the scales and see that the coal is properly weighed, and that a correct account of the same is kept; and for this purpose he shall have access at all times to the beam box of said scale, and be afforded facilities for the discharge of his duties while the weighing is being performed.

(b) The agent employed by the miners as aforesaid to act as checkweighman shall, before entering upon his duties, make and subscribe to an oath before some officer duly authorized to administer oaths, that he will faithfully discharge the duties of checkweighman; such oath shall be kept conspicuously posted at the place of weighing. (Section 3, amended June 16, 1891.)

SEC. 4. Any person, company or firm having or using any scale or scales for the purpose of weighing the output of coal at mines, so arranged or constructed that fraudulent weighing may be done thereby, or who shall knowingly resort to or employ any means whatsoever by reason of which such coal is not correctly weighed or reported in accordance with the provisions of this Act, or any weighman or checkweighman who shall fraudulently weigh or record the weights of such coal, or connive at or consent to such fraudulent weighing and recording shall be deemed guilty of a misdemeanor, and shall, upon conviction, for each such offense be punished by a fine of not less than two hundred dollars (\$200.00) nor more than five hundred dollars (\$500.00), or by imprisonment in the county jail for a period not to exceed sixty (60) days, or by both such fine and imprisonment, proceedings to be instituted in any court of competent jurisdiction.

SEC. 5. Any person, owner or agent operating a coal mine in this State, who shall fail to comply with the provisions of this Act, or who shall obstruct or hinder the carrying out of its requirements, shall be fined for the first offense not less than fifty dollars (\$50.00) nor more than two hundred dollars (\$200.00); for the second offense not less than two hundred dollars (\$200.00) nor more than five hundred dollars (\$500.00), and for the third offense not less than five hundred dollars (\$500.00), or to be imprisoned in the county jail not less than six months nor more than one year: Provided, that the provisions of this Act shall apply only to coal mines whose product is shipped by rail or water.

SEC. 6. That an Act entitled, "An Act to provide for the weighing of coal at the mines," approved June 14, 1883, in force July 1, 1883; as amended and approved June 29, 1885, in force July 1, 1885, be, and the same is hereby repealed.

(Repealed by act June 6, 1911. See page 229.)

ANNOTATIONS.

CONSTITUTIONALITY OF STATUTE.

The act of June 17, 1887, was amended by the act of June 16, 1891, to provide for the weighing of coal at the mines, and, like the original act, is unconstitutional as being in violation of section 2 of article 2 of the constitution.

Harding v. People, 160 Ill. 459, p. 466;

Ramsey v. People, 142 Ill., p. 380;

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54.

CHECK WEIGHMEN—AMENDATORY ACT.

LAWS 1891, P. 170.

JUNE 16, 1891.

AN ACT to amend an act entitled "An act to provide for the weighing of coal at the mines, and to repeal a certain act therein named. (June 17, 1887.)"

SECTION 1. Be it enacted, etc.: That section 3 of an act entitled "An act to provide for the weighing of coal at the mines, and to repeal an act therein named," (approved June 17, 1887,) be amended to read as follows:

SEC. 3. It shall be lawful for the miners employed in any coal mine in this State to furnish a check weighman at their own expense, whose duty it shall be to balance the scales and see that the coal is properly weighed, and that a correct account of the same is kept, and for this purpose he shall have access at all times to the beam box of said scales and be afforded facilities for the discharge of his duties while the weighing is being performed. The agent employed by the miners as aforesaid to act as check weighman shall before entering upon his duties make and subscribe to an oath before some officer duly authorized to administer oaths, that he will faithfully discharge the duties of check weighman; such oath shall be kept conspicuously posted at the place of weighing.

ANNOTATIONS.**AMENDATORY ACT—VALIDITY.**

The act of June 16, 1891, was an attempt to amend the act approved June 17, 1877, providing for the weighing of coal at mines. The purpose of the amendment was doubtless to avoid objections made to the original act. But the amendatory act is clearly in violation of section 2 of article 2 of the Constitution and is itself void.

Harding v. People, 160 Ill. 459, p. 462.

WEIGHING COAL IN GROSS.

LAWS 1891, P. 170.

JUNE 10, 1891.

AN ACT to provide for the weighing in gross of coal hoisted at mines.

SECTION 1. Be it enacted, etc.: That it shall be unlawful for any owner, agent or operator of any coal mine, whose miners are paid upon the basis of the quantity of coal which each shall mine and deliver to said employer, to take any portion of the same by any process of screening, or by any other device, without fully accounting for and crediting the same to the miner from whose output such portion is screened or taken.

SEC. 2. That all coal shall be weighed in the pit cars before being dumped into screens or chutes, two thousand pounds to the ton. A correct record shall be kept of the weight of each miner's car, which record shall be kept open at all reasonable times for the inspection of all miners or others peculiarly interested in the product of such mine. The person authorized to weigh the coal and keep such record shall, before entering upon his duties, make and subscribe to an oath before some magistrate or other officer authorized to administer oaths that he will accurately weigh and carefully keep a true record of coal delivered from mines. This oath shall be kept conspicuously posted at the place of weighing.

SEC. 3. Any person, owner or agent operating a coal mine in this State, who shall fail to comply with the provisions of this act, shall be fined for the first offense, not less than twenty-five dollars (\$25) nor more than fifty dollars (\$50), for the second offense not less than one hundred dollars (\$100) nor more than two hundred dollars (\$200), and for the third offense be imprisoned in the county jail not less than six months nor more than one year.

ANNOTATIONS.

CONSTRUCTION AND VALIDITY OF STATUTE.

This statute attempts to take from both employer and employee engaged in the mining business, the right and power of fixing by contract the amount of wages the employee is to receive and the mode in which such wages are to be ascertained. The statute makes it imperative, where the miner is paid on the basis of the amount of coal mined, that the coal shall be weighed on the pit cars before being screened and the compensation shall be computed upon the weight of the unscreened coal. There is nothing in the business of coal mining which renders either the employer or employee less capable to contract in respect to wages than in any of the other branches of business, and the attempt on the part of the legislature to impose restrictions upon persons engaged in coal mining as to the power to contract as to wages, is repugnant to the constitutional limitation in that it deprives coal mine operators of the property right of making contracts, without due process of law.

Ramsey v. People, 142 Ill. 380, p. 385;

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54.

This act not only singles out the operator of a mine and imposes restrictions and burdens upon him as to the use and enjoyment of his property that are not imposed upon other branches of business similarly situated and conducted, but it divides the operators of mines and only applies its provisions to those whose product is shipped in a certain manner. No possible reason for distinction affecting any interest justifying the division of mines made by the act has been suggested except that it might be intended to reach mines in which a large number of miners were employed. But this is not the division or distinction made and does not in any manner follow such division. It is not the language or purport of the act, but the act applies equally to the owner of a small mine, where the product may not exceed a carload per day and to the owner of the largest mine. The distinction between operators who sell their product at the mine to some shipper who ships it to market and those who themselves ship their coal by rail or by water is purely arbitrary and any reason that would apply to one calling for a restriction upon the manner of doing business, would be equally applicable to the other, and special burdens and restrictions upon one class not imposed upon the other constitute an arbitrary deprivation of rights. As the act makes that an offense if committed by the person engaged in one branch of mining which if done by persons of another branch of the same business is lawful, without any reason for distinction between the two, it must be regarded as unconstitutional.

Harding v. People, 160 Ill. 459, p. 465;

Whitebreast Fuel Co. v. People, 175 Ill. 51, p. 54;

Kellyville Coal Co. v. Harrier, 207 Ill. 624, p. 629.

SCALES AND WEIGHMAN.

LAW 1890, P. 301.

APRIL 18, 1890.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Section 24 only of this act is inserted here under the proper title. For the complete act see page 187.

WEIGHING AND WEIGHMAN.

SEC. 24. SCALES.—(a) The operator of every coal mine where miners are paid by the weight of their output, shall provide at such mine suitable and

accurate scales of standard manufacture for the weighing of such coal, and a correct record shall be kept of all coal so weighed, and said record shall be open at all reasonable hours to the inspection of miners and others interested in the product of said mine.

WEIGHMEN.—(b) The person authorized to weigh the coal and keep the record as aforesaid shall, before entering upon his duties, make and subscribe to an oath before some person duly authorized to administer oaths, that he will accurately weigh and carefully keep a true record of all coal weighed, and such affidavit shall be kept conspicuously posted at the place of weighing.

CHECK WEIGHMAN.—(c) It shall be permitted to the miners at work in any coal mine to employ a check-weighman at their option and at their own expense, whose duty it shall be to balance the scales and see that the coal is properly weighed, and that a correct account of the same is kept, and for this purpose he shall have access at all times to the beam box of said scales, and be afforded every facility for verifying the weights while the weighing is being done. The check-weighman so employed by the miners, before entering upon his duties, shall make and subscribe to an oath before some person duly authorized to administer oaths, that he will faithfully discharge his duties as check-weighman, and such oath shall be kept conspicuously posted at the place of weighing.

DUTY OF MINE OPERATORS AS TO WEIGHING COAL.

SEE page 48.

LAWS 1911, P. 888.

JUNE 6, 1911.

AN ACT to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein.

NOTE.—Section 27 only of this act is inserted here under the appropriate title. For the complete act see page 212.

SEC. 27. SCALES.—(a) The operator of every coal mine where miners are paid by the weight of their output, shall provide at such mine suitable and accurate scales for the weighing of such coal, and a correct record shall be kept of all coal so weighed, and said record shall be open at all reasonable hours to the inspection of miners and others interested in the product of said mine.

WEIGHMAN.—(b) The person authorized to weigh the coal and keep the record as aforesaid shall, before entering upon his duties, make and subscribe to an oath before some person duly authorized to administer oaths, that he will accurately weigh and carefully keep a true record of all coal weighed, and such affidavit shall be kept conspicuously posted at the place of weighing.

CHECK WEIGHMAN.—(c) The miners at work in any coal mine may employ a check weighman at their option and at their own expense, whose duty it shall be to balance the scales and see that the coal is properly weighed, and that a correct account of the same is kept, and for this purpose he shall have access at all times to the beam box of said scales, and be afforded every facility for verifying the weights while the weighing is being done. The check weighman so employed by the miners, before entering upon his duties, shall make and subscribe to an oath before some person duly authorized to administer oaths, that he will faithfully discharge his duties as check weighman, and such oath shall be kept conspicuously posted at the place of weighing.

WORKMEN'S COMPENSATION ACT.

COMPENSATION FOR ACCIDENTAL INJURIES.

LAWS 1911, P. 315.

JUNE 10, 1911.

AN ACT to promote the general welfare of the People of this State, by providing compensation for accidental injuries or death suffered in the course of employment. (Repealed. See pages 418, 458.)

SECTION 1. Be it enacted, etc.: That any employer covered by the provisions of this Act in this State may elect to provide and pay compensation for injuries sustained by any employe arising out of and in the course of the employment according to the provisions of this Act, and thereby relieve himself from any liability for the recovery of damages, except as herein provided. If, however, any such employer shall elect not to provide and pay the compensation to any employe who has elected to accept the provisions of this Act, according to the provisions of this Act he shall not escape liability for injuries sustained by such employe arising out of and in the course of his employment, because

1. The employe assumed the risks of the employer's business.

2. The injury or death was caused in whole or in part by the negligence of a fellow servant.

3. The injury or death was proximately caused by the contributory negligence of the employe, but such contributory negligence shall be considered by the jury in reducing the amount of damages.

a. Every such employer is presumed to have elected to provide and pay the compensation according to the provisions of this Act unless and until notice in writing of his election to the contrary is filed with the State Bureau of Labor Statistics.

b. Every employer within the provisions of this Act failing to file such notice shall be bound hereby as to all his employes who shall elect to come within the provisions of this Act until January 1st of the next succeeding year and for terms of each year thereafter: Provided, any such employer may elect to discontinue the payments of compensation herein provided only at the expiration of any such calendar year, by filing notice of his intention to discontinue such payments, with the State Bureau of Labor Statistics, at least sixty days prior to the expiration of any such calendar year, and by posting such notice in the plant, shop, office or place of work, or by personal service, in written or printed form, upon such employe, at least sixty days prior to the expiration of any such calendar year.

c. In the event any employer elects to provide and pay compensation provided in this Act, then every employe of such employer, as a part of his contract of hiring or who may be employed at the time of the taking effect of this Act and the acceptance of its provisions by the employer, shall be deemed to have accepted all the provisions of this Act and shall be bound thereby unless within thirty days after such hiring and after the taking effect of this Act, he shall file a notice to the contrary with the secretary of the State Bureau of Labor Statistics, whose duty it shall be to immediately notify the employer, and if so notified, the employer shall not be deprived of any of his common law or statutory defenses, and until such notice to the contrary is given to the em-

ployer, the measure of liability of the employer for any injury shall be determined according to the compensation provisions of this Act; Provided, however, that before any such employe shall be bound by the provisions of this Act, his employer shall either furnish to such employe personally at the time of his hiring, or post in a conspicuous place at the plant or in the room or place where such employe is to be employed, a legible statement of the compensation provisions of this Act.

Sec. 2. The provisions of this Act shall apply to every employer in the State engaged in the building, maintaining or demolishing of any structure; in any construction or electrical work; in the business of carriage by land or water and loading and unloading in connection therewith (except as to carriers who shall be construed to be excluded herefrom by the laws of the United States relating to liability to their employes for personal injuries while engaged in interstate commerce where such laws are held to be exclusive of all State regulations providing compensation for accidental injuries or death suffered in the course of employment); in operating general or terminal store-houses; in mining, surface mining, or quarrying; in any enterprise, or branch thereof, in which explosive materials are manufactured, handled or used in dangerous quantities; in any enterprise wherein molten metal or injurious gases or vapors or inflammable fluids are manufactured, used, generated, stored or conveyed in dangerous quantities; and in any enterprise in which statutory regulations are now or shall hereafter be imposed for the guarding, using or the placing of machinery or appliances, or for the protection and safe-guarding of the employes therein, each of which employments is hereby determined to be especially dangerous, in which from the nature, conditions and means of prosecution of the work therein, extraordinary risks to life and limb of the employe engaged therein are inherent, necessary or substantially unavoidable, and as to each of which employments it is deemed necessary to establish a new system of compensation for accidents to the employees therein. (Repealed. Page 458.)

Sec. 3. No common law or statutory right to recover damages for injury or death sustained by any employe while engaged in the line of his duty as such employe other than the compensation herein provided shall be available to any employe who has accepted the provisions of this Act or to any one wholly or partially dependent upon him or legally responsible for his estate: Provided, that when the injury to the employe was caused by the intentional omission of the employer, to comply with statutory safety regulations, nothing in this Act shall affect the civil liability of the employer. If the employer is a partnership, such omission must be that of one of the partners thereof, and if a corporation, that of any elective officer thereof.

Sec. 4. The amount of compensation which the employer who accepts the provisions of this Act shall pay for injury to the employe which results in death, shall be:

a. If the employe leaves any widow, child or children, or parents or other lineal heirs to whose support he had contributed within five years previous to the time of his death, a sum equal to four times the average annual earnings of the employe, but not less in any event than one thousand five hundred dollars, and not more in any event than three thousand five hundred dollars. Any weekly payments, other than necessary medical or surgical fees, shall be deducted in ascertaining such amount payable on death.

b. If the employe leaves collateral heirs dependent upon his earnings, such a percentage of the sum provided in section "a" as the contributions which deceased made to the support of these dependents, bore to his earnings.

c. If the employe leaves no widow or child or children, parents or lineral or collateral heirs dependent upon his earnings, a sum not to exceed one hundred and fifty dollars for burial expenses.

d. All compensation provided for in this section to be paid in case injury results in death, shall be paid in installments equal to one-half the average earnings, at the same intervals at which the wages or earnings of the employe were paid while he was living; or if this shall not be feasible, then the installments shall be paid weekly.

e. The compensation to be paid for injuries which result in death, as provided for in this section, shall be paid to the personal representative of the deceased employe and shall be distributed by such personal representative to the beneficiaries entitled thereto, in accordance with the laws of this State relating to the descent and distribution of personal property.

SEC. 5. The amount of compensation which the employer who accepts the provisions of this Act shall provide and pay for injury to the employe resulting in disability shall be:

a. Necessary first aid, medical, surgical and hospital services, also medicine and hospital services for a period not longer than eight weeks, not to exceed, however, the amount of \$200.00, also necessary services of a physician or surgeon during such period of disability, unless such employe elects to secure his own physician or surgeon.

b. If the period of disability lasts for more than six working days, and such fact is determined by the physician or physicians, as provided in section 9, compensation equal to one-half of the earnings, but not less than \$5.00 nor more than \$12.00 per week, beginning on the eighth day of disability and as long as the disability lasts, or until the amount of compensation paid equals the amount payable as a death benefit.

c. If any employe, by reason of any accident arising out of and in the course of his employment, receive any serious and permanent disfigurement to the hands or face, but which injury does not actually incapacitate the employe from pursuing his usual or customary employment so that it is possible to measure compensation in accordance with the scale of compensation and the methods of computing the same herein provided, such employe shall have the right to resort to the arbitration provisions of this Act for the purpose of determining a reasonable amount of compensation to be paid to such employe, but not to exceed one-quarter ($\frac{1}{4}$) the amount of his compensation in case of death.

d. If after the injury has been received it shall appear upon medical examination as provided for in section 9, that the employe has been partially, though permanently incapacitated from pursuing his usual and customary line of employment, he shall receive compensation equal to one-half of the difference between the average amount which he earned before the accident, and the average amount which he is earning, or is able to earn in some suitable employment or business after the accident, if such employment is secured.

e. In the case of complete disability which renders the employe wholly and permanently incapable of work, compensation for the first eight years after the day the injury was received, equal to 50 per cent of his earnings, but not less than \$5.00 nor more than \$12.00 per week. If complete disability continues after the payment of a sum equal to the amount of the death benefit or after the expiration of the eight years, then a compensation during life, equal to 8 per cent of the death benefit which would have been payable had the accident resulted in death. Such compensation shall not be less than \$10.00 per month and shall be payable monthly.

(1) In case death occurs before the total of the payments made equals the amount payable as a death benefit, as provided in section 4, article a, then in case the employe leaves any widow, child or children, or parents, or other lineal heirs, they shall be paid the difference between the compensation for death and the sum of such payment, but in no case shall this sum be less than \$500.00.

(2) In cases of complete disability, after compensation has been paid at the specified rate for a term of at least six months, the employe shall have the privilege of filing a petition in accordance with article d of section 4 of this Act, asking for a lump sum payment of the difference between the sums of the payments received and the compensation to which he was entitled when such permanent disability has been definitely determined. For the purpose of this section, blindness or total irrecoverable loss of sight, the loss of both feet at or above the ankle, the loss of both hands at or above the wrist, the loss of one hand and one foot, an injury to the spine resulting in permanent paralysis of the legs or arms, and a fracture of the skull resulting in incurable imbecility or insanity, shall be considered complete and permanent disability: Provided, these specific cases of complete and permanent disability shall not, however, be construed as excluding other cases.

(3) In fixing the amount of the disability payments, regard shall be had to any payments, allowance or benefit which the employe may have received from the employer during the period of his incapacity, except the expenses of necessary medical or surgical treatment. In no event, except in cases of complete disability as defined above, shall any weekly payment payable under the compensation plan in this section provided exceed \$12.00 per week, or extend over a period of more than eight years from the date of the accident. In case an injured employe shall be incompetent at the time when any right or privilege accrues to him under the provisions of this Act, a conservator or guardian of the incompetent, appointed pursuant to law, may on behalf of such incompetent, claim and exercise any such right or privilege with the same force and effect as if the employe himself had been competent and had claimed or exercised said right or privilege; and no limitations of time by this Act provided, shall run so long as said incompetent employe had no conservator or guardian.

Sec. 5½. Any person entitled to compensation under this Act, or any employer who shall be bound to pay compensation under this Act, who shall desire to have such compensation, or any part thereof, paid in a lump sum, may petition any court of competent jurisdiction of the county in which the employe resided or worked at the time of disability or death, asking that such compensation be so paid, and if upon proper notice to the interested parties, and a proper showing made before such court, it appears to the best interest of the parties that such compensation be so paid, the court shall order payment of a lump sum, and where necessary, upon proper application being made, a guardian, conservator or administrator, as the case may be, shall be appointed for any person under disability who may be entitled to any such compensation, and an employer bound by the terms of this Act, and liable to pay such compensation, may petition for such appointment where no such legal representatives have been appointed or acting for such party or parties so under disability.

Sec. 6. The basis for computing the compensation provided for in sections 4 and 5 of the Act shall be as follows:

a. The compensation shall be computed on the basis of the annual earnings which the injured person received as salary, wages or earnings in the employment of the same employer during the year next preceding the injury.

b. Employment by the same employer shall be taken to mean employment by the same employer in the grade in which the employe was employed at the time of the accident, uninterrupted by absence from work due to illness or any other unavoidable cause.

c. The annual earnings if not otherwise determinable shall be regarded as 300 times the average daily earnings in such computation.

d. If the injured person has not been engaged in the employment for a full year immediately preceding the accident the compensation shall be computed according to the annual earnings which persons of the same class in the same or in neighboring employments of the same kind have earned during such period. And if this basis of computation is impossible, or should appear to be unreasonable, three hundred times the amount which the injured person earned on an average on those days when he was working during the year next preceding the accident, shall be used as a basis for the computation.

e. In the case of injured employes who earn either no wage or less than three hundred times the usual daily wage or earnings of the adult day laborers in the same line of industry of that locality, the yearly wage shall be reckoned as three hundred times the average daily local wage.

f. As to employes in employments in which it is the custom to operate for a part of the whole number of working days in each year, such number shall be used instead of three hundred as a basis for computing the annual earnings, provided the minimum number of days which shall be used for the basis of the year's work shall be not less than two hundred.

g. Earnings, for the purpose of this section, shall be based on the earnings for the number of hours commonly regarded as a day's work for that employment, and shall exclude overtime earnings. The earnings shall not include any sum which the employer has been accustomed to pay the employe to cover any special expense entailed on him by the nature of his employment.

h. In computing the compensation to be paid to any employe who before the accident for which he claims compensation, was disabled and drawing compensation under the terms of this Act, the compensation for each subsequent injury shall be apportioned according to the proportion of incapacity and disability caused by the respective injuries which he may have suffered.

SEC. 7. The compensation herein provided shall be the measure of the responsibility which the employer has assumed for injuries or death that may occur to employes in his employment subject to the provisions of this Act, and it shall not be in any way reduced by contributions from employees.

SEC. 8. If it is proved that the injury to the employe resulted from his deliberate intention to cause such injury, no compensation with respect to that injury shall be allowed.

SEC. 9. Any employe entitled to receive disability payments shall be required if requested by the employer to submit himself for examination at the expense of the employer to a duly qualified medical practitioner or surgeon selected by the employer, at a time and place reasonably convenient for the employe, as soon as practicable after the injury, and also one week after the first examination, and thereafter at intervals not oftener than once every four weeks, which examinations shall be for the purpose of determining the nature, extent and probable duration of the injury received by the employe, and for the purpose of adjusting the compensation which may be due the employe from time to time for disability according to the provisions of sections 4 and 5 of this Act: Provided, however, that such examination shall be made in the presence of a duly qualified medical practitioner or surgeon provided

and paid for by the employe, if such employe so desires, and in the event of a disagreement between said medical practitioners or surgeons as to the nature, extent or probable duration of said injury or disability, they may agree upon a third medical practitioner or surgeon, and, failing to agree upon such third medical practitioner or surgeon, the judge of the county court of the county where the employe resided or was employed at the time of the injury, shall within six days after petition filed in such court for that purpose, select a third medical practitioner or surgeon and the majority report of such three physicians as to the nature, extent and probable duration of such injury or disability shall be used for the purpose of estimating the amount of compensation payable under this Act. If the employe refuses so to submit himself to examination or unnecessarily obstructs the same, his right to compensation payments shall be temporarily suspended until such examination shall have taken place, and no compensation shall be payable under this Act during such period.

SEC. 10. Any question of law or fact arising in regard to the application of this law in determining the compensation payable hereunder shall be determined either by agreement of the parties or by arbitration as herein provided. In case any such question arises which can not be settled by agreement, the employe and the employer shall each select a disinterested party and the judge of the county court, or other court of competent jurisdiction, of the county where the injured employe resided or worked at the time of the injury, shall appoint a third disinterested party, such persons to constitute a board of arbitrators for the purpose of hearing and determining all such disputed questions of law or fact arising in regard to the application of this law in determining the compensation payable hereunder; and it shall be the duty of both employe and employer to submit to such board of arbitrators not later than ten days after the selection and appointment of such arbitrators all facts or evidence which may be in their possession or under their control relating to the questions to be determined by said arbitrators; and said board of arbitrators shall hear all the evidence submitted by both parties and they shall have access to any books, papers or records of either the employer or the employe showing any facts which may be material to the questions before them, and they shall be empowered to visit the place or plant where the accident occurred, to direct the injured employe to be examined by a regular practicing physician or surgeon, and to do all other acts reasonably necessary for a proper investigation of all matters in dispute. A copy of the report of the arbitrators in each case shall be prepared and filed by them with the State Bureau of Labor Statistics, and shall be binding upon both the employer and employe except for fraud and mistake: Provided, that either party to such arbitration shall have the right to appeal from such report or award of the arbitrators to the circuit court or the court that appointed the third arbitrator of the county where the injury occurred by filing a petition in such court within twenty days after the filing of the report of the arbitrators, and upon filing a good and sufficient bond, in the discretion of the court, and upon such appeal the questions in dispute shall be heard de novo, and either party may have a jury upon filing a written demand therefor with his petition.

SEC. 11. Any person entitled to payment under the compensation provisions of this Act from any employer shall have the same preferential claim therefor against the property of the employer as is now allowed by law for a claim by such person against such employer for unpaid wages or for personal services, such preference to prevail against wage claims of all other employes, not entitled to compensation for injuries, and the payments due under such com-

pensation provisions shall not be subject to attachment, levy, execution, garnishment or satisfaction of debts, except to the same extent and in the same manner as wages or earnings for personal service are now subject to attachment, levy, execution, garnishment or satisfaction of debts, under the laws of this State, and shall not be assignable. Any right to receive compensation hereunder shall be extinguished by the death of the person or persons entitled thereto, subject to the provisions of this Act relative to compensation for death received in the course of employment. No claim of any attorney at law for services in securing a recovery under this Act shall be an enforceable lien thereon unless the amount of the same be approved in writing by a judge of a court of record, which approval may be made in term time or vacation.

SEC. 12. Any contract or agreement made by any employer or his agent or attorney with any employee or any other beneficiary of any claim under the provisions of this Act within seven days after the injury shall be presumed to be fraudulent.

SEC. 13. No employe or beneficiary shall have power to waive any of the provisions of this Act in regard to the amount of compensation which may be payable to such employe or beneficiary hereunder.

SEC. 14. No proceedings for compensation under this Act shall be maintained unless notice of the accident has been given to the employer as soon as practicable after the happening thereof, and during such disability, and unless claim for compensation has been made within six months after the injury, except that in case of an accident resulting in temporary disability, notice of such accident must be given to the employer within thirty days after said accident; or in case of the death of the employee or in the event of his incapacity, within six months after such death or incapacity, or in the event that payments have been made under the provisions of this Act, within six months after such payments have ceased. No want or defect or inaccuracy of such notice shall be a bar to the maintenance of proceedings by arbitration or otherwise by the employe, unless the employer proves that he is unduly prejudiced in such proceedings by such want, defect or inaccuracy. Notice of the accident shall, in substance apprise the employer of the claim of compensation made and shall state the name and address of the employe injured, the approximate date and place of the accident, if known, and in simple language the cause thereof; which notice may be served personally or by registered mail, addressed to the employer at his last known residence or place of business: Provided, that the failure on the part of any person entitled to such compensation to give such notice shall not relieve the employer from his liability for such compensation, when the facts and circumstances of such accident are known to such employer or his agent, supervising work in which such employe was engaged at the time of the injury.

SEC. 15. This Act shall not affect or disturb the continuance of any existing insurance, mutual aid, benefit, or relief association or department, whether maintained in whole or in part by the employer or whether maintained by the employee, the payment of benefits of such association or department being guaranteed by the employer or by some person, firm or corporation for him: Provided, the employer contributes to such association or department an amount sufficient to insure the employee or other beneficiary the full compensation herein provided, exclusive of the cost of the maintenance of such association or department without any expense to the employee. This Act shall not prevent the organization and maintaining under the insurance law of this State of any benefit or insurance company for the purpose of insuring against the compensation provided for in this Act, the expense of which is maintained by the employer. This Act shall not prevent the organization or maintaining under

the insurance laws of this State of any voluntary mutual aid, benefit or relief association among employes for the payment of additional accident or sick benefits.

No existing insurance, mutual aid, benefit or relief association or department shall, by reason of anything herein contained, be authorized to discontinue its operation without first discharging its obligations to any and all persons carrying insurance in the same or entitled to relief or benefits therein.

Any contract of employment, relief benefit, or insurance or other device whereby the employe is required to pay any premium or premiums for insurance against the compensation provided for in this Act shall be null and void, and any employer withholding from the wages of any employe any amount for the purpose of paying any such premium shall be guilty of a misdemeanor and punishable by a fine of not less than ten dollars nor more than twenty-five dollars in each offense in the discretion of the court.

SEC. 16. Any person who shall become entitled to compensation under the provisions of this Act, shall, in the event of his inability to recover such compensation from the employer on account of his insolvency, be subrogated to all the rights of such employer against any insurance company or association which may have insured such employer against loss growing out of the compensation required by the provisions of this Act to be paid by such employer, and in such case only, a payment of the compensation that has accrued to the person entitled thereto in accordance with the provisions of this Act, shall relieve such insurance company from such liability. (Amended.)

SEC. 17. Where the injury for which compensation is payable under this Act was caused under circumstances creating a legal liability in some person, other than the employer, to pay damages in respect thereof:

a. The employe or beneficiary may take proceedings both against that person to recover damages and against the employer for compensation, but the amount of the compensation which he is entitled to under this Act shall be reduced by the amount of damages recovered.

b. If the employe or beneficiary has recovered compensation under this Act, the employer by whom the compensation was paid or the person who has been called upon to pay the indemnity under section 4 and 5 of this Act, may be entitled to indemnity from the person so liable to pay damages as aforesaid, and shall be subrogated to the rights of the employe to recover damages therefor.

SEC. 18. An agreement or award may, at any time after six months, and before eighteen months, from the date of filing, be reviewed, upon the application of either party, on the ground that the incapacity of the employe has subsequently increased or diminished. Such application shall be made to any court of competent jurisdiction; and unless the parties consent to arbitration, the court may appoint a medical practitioner to examine the employe and report upon his condition; and upon his report, and after hearing all the evidence the court may modify such agreement or award, as may be just, by ending, increasing or diminishing the compensation, subject to the limitations hereinbefore provided.

SEC. 19. It shall be the duty of every employer within the provisions of this Act to send to the secretary of the State Bureau of Labor Statistics in writing, an immediate report of all accidents or injuries arising out of or in the course of the employment and resulting in death; it shall also be the duty of every such employer to report between the 15th and the 25th of each month to the secretary of the State Bureau of Labor Statistics all accidents or injuries for which compensation has been paid under this Act, which accidents or injuries

entail a loss to the employe of more than one week's time, and in case the injury results in permanent disability, such report shall be made as soon as it is determined that such permanent disability has resulted or will result from such injury. All such reports shall state the date of the injury, including the time of day or night, the nature of the employer's business, the age, sex, conjugal condition of the injured person, the specific occupation of the injured person, the direct cause of the injury and the nature of the accident, the nature of the injury, the length of disability and, in case of death, the length of disability before death, the wages of the injured person, whether compensation has been paid to the injured person, or to his legal representative or his heirs or next of kin, the amount of compensation paid, the amount paid for physicians', surgeons' and hospital bills, and by whom paid, and the amount paid for funeral or burial expenses, if known. The making of reports as provided herein shall release the employer covered by the provisions of this Act from making such reports to any other officer of the State.

SEC. 20. Any person, firm or corporation who undertakes to do or contracts with others to do, or have done for him, them or it, any work embraced in section 2 of this Act, requiring such dangerous employment of employes in, or about premises where he, they or it, as principal or principals, contract to do such work or any part thereof, and does not require that the compensation provided for in this Act shall be insured to the employe or beneficiary by any such person, firm or corporation undertaking to do such work and any such person, firm or corporation who creates or carries into operation any fraudulent scheme, artifice or device to enable him, them or it to execute such work without such person, firm or corporation being responsible to the employe or beneficiaries entitled to such compensation under the provisions of this Act, such person, firm or corporation shall be included in the term "employer" and with the immediate employer shall be jointly and severally liable to pay the compensation herein provided for, and be subject to all the provisions of this Act.

SEC. 21. The term "employe" as used in this Act shall be held to include only such persons as may be exposed to the necessary hazards of carrying on any employment or enterprise referred to in section 2 of this Act. Persons whose employment is of a casual nature and who are employed otherwise than for the purpose of the employers' trade or business, are not included in the foregoing definition.

SEC. 22. Section 21 shall not be construed to include any employee engaged in any work of an incidental character unconnected with the dangers necessarily involved in carrying on any employment or enterprise referred to in section 2, or in any work of a clerical or administrative nature which does not expose the employe to the inherent hazards of any such employment or enterprise.

SEC. 23. Any wilful neglect, refusal, or failure to do the things required to be done by any section, clause, or provision of this Act, on the part of the persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any court officer, member of an arbitration board herein provided for, or with the secretary of the Bureau of Labor Statistics or his deputy, in the discharge of the duties herein imposed upon any of them, or any refusal to comply with the terms of this Act, shall be deemed a misdemeanor, punishable by a fine of not less than \$10.00 nor more than \$500, at the discretion of the court.

SEC. 24. The right of action for damages caused by any such injury, at common law or other statute in force prior to the taking effect hereof shall

not be affected by this Act and every existing right of action for negligence or to recover damages for injury resulting in death, is continued and nothing in this Act shall be construed as limiting the right of such action so accrued before the taking effect of this Act.

SEC. 24. The invalidity of any portion of this Act shall in no way affect the validity of any other portion thereof which can be given effect without such invalid part.

SEC. 25. This Act shall take effect and be in force on and after the 1st day of May, 1912. (See following act.)

WORKMEN'S COMPENSATION—SECOND GENERAL ACT.

LAW 1913, P. 337.

JUNE 23, 1913.

AN ACT To promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment within this State; providing for the enforcement and administering thereof, and a penalty for its violation, and repealing an Act entitled, "An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment," approved June 10, 1911, in force May 1, 1912.

(Sections 3, 7, 8, 9, 12, 13, 14, 16, 19, 21, and 26 amended. See page 418.)

(Sections 2, 3, 5, 7, 8, 13, 14, 16, 19, and 31 amended. See pages 445, 455.)

SECTION 1. That any employer in this State may elect to provide and pay compensation for accidental injuries sustained by any employee arising out of and in the course of the employment according to the provisions of this act, and thereby relieve himself from any liability for the recovery of damages, except as herein provided.

(a) Election by an employer to provide and pay compensation according to the provisions of this act shall be made by the employer filing notice of such election with the Industrial Board.

(b) Every employer within the provisions of this act who has elected to provide and pay compensation according to the provisions of this act shall be bound thereby as to all his employees covered by this act until January 1st of the next succeeding year and for terms of each year thereafter: Provided, Any such employer may elect not to provide and pay the compensation herein provided for accidents resulting in either injury or death and occurring after the expiration of any such calendar year by filing notice of such election with the Industrial Board at least sixty days prior to the expiration of any such calendar year, and by posting such notice at a conspicuous place in the plant, shop, office, room, or place where such employee is employed, or by personal service, in written or printed form, upon such employee, at least sixty days prior to the expiration of any such calendar year.

(c) In the event any employer elects to provide and pay the compensation provided in this act, then every employee of such employer, as a part of his contract of hiring or who may be employed at the time of the taking effect of this act and the acceptance of its provisions by the employer, shall be deemed to have accepted all the provisions of this act and shall be bound thereby unless within thirty days after such hiring or after the taking effect of this act, and its acceptance by the employer, he shall file a notice to the contrary with the Industrial Board, whose duty it shall be to immediately notify the employer, and if so notified, the employer shall not be deprived of any common law or statutory defenses existing but for this act; and until such notice to the contrary is given to the employer, the measure of liability of the employer shall be determined according to the compensation provisions of this act: Provided, however, That any employee may withdraw from the operation of this act

upon filing a written notice of withdrawal at least ten days prior to January 1st of any year with the Industrial Board, whose duty it shall be to immediately notify the employer by registered mail, and, if so notified, the employer shall not be deprived of any common law or statutory defenses existing but for this act, and until such notice to the contrary is given to the employer the measure of liability of the employer shall be determined according to the compensation provisions of this act.

(d) Any employer or employee may, without prejudice to any existing right or claim, withdraw his election to reject this act by giving thirty days' written notice in such manner and form as may be provided by the Industrial Board. (Amended. See page 455.)

SEC. 2. Every employer enumerated in section 3, paragraph (b), shall be conclusively presumed to have filed notice of his election as provided in section 1, paragraph (a), and to have elected to provide and pay compensation according to the provisions of this act, unless and until notice in writing of his election to the contrary is filed with the Industrial Board and unless and until the employer shall either furnish to his employee personally or post at a conspicuous place in the plant, shop, office, room, or place where such employee is to be employed, a copy of said notice of election not to provide and pay compensation according to the provisions of this act; which notice of nonelection, if filed and posted as herein provided, shall be effective until withdrawn; and such notice of nonelection may be withdrawn as provided in this act. (Repealed. Pages 455, 458.)

SEC. 3. (a) In any action to recover damages against an employer, engaged in any of the occupations, enterprises or businesses enumerated in paragraph (b) of this section, who shall elect not to provide and pay compensation to any employee, according to the provisions of this act, it shall not be a defense, that: First, the employee assumed the risks of the employment; second, the injury or death was caused in whole or in part by the negligence of a fellow servant; or third, the injury or death was proximately caused by the contributory negligence of the employee.

(b) The provisions of paragraph (a) of this section shall only apply to an employer engaged in any of the following occupations, enterprises or businesses, namely:

1. The building, maintaining, repairing or demolishing of any structure;
2. Construction, excavating or electrical work;
3. Carriage by land or water and loading and unloading in connection therewith;
4. The operation of any warehouse or general or terminal store houses;
5. Mining, surface mining or quarrying;
6. Any enterprise in which explosive materials are manufactured, handled or used in dangerous quantities;
7. In any enterprise wherein molten metal, or explosive or injurious gases or vapors, or inflammable vapors or fluids, or corrosive acids, are manufactured, used, generated, stored or conveyed in dangerous quantities;
8. In any enterprise in which statutory or municipal ordinance regulations are now or shall hereafter be imposed for the regulating, guarding, use or the placing of machinery or appliances, or for the protection and safeguarding of the employees or the public therein; each of which occupations, enterprises or businesses are hereby declared to be extrahazardous. (Amended. See pages 419, 455.)

SEC. 4. The term "employer" as used in this act shall be construed to be:

First. The State and each county, city, town, township, incorporated village, school district, body politic, or municipal corporation therein.

Second. Every person, firm, public or private corporation, including hospitals, public service, eleemosynary, religious, or charitable corporations or associations who has any person in service or under any contract for hire, express or implied, oral or written, and who, at or prior to the time of the accident to the employee for which compensation under this act may be claimed, shall in the manner provided in this act have elected to become subject to the provisions of this act, and who shall not, prior to such accident, have effected a withdrawal of such election in the manner provided in this act.

Sec. 5. The term "employee" as used in this act shall be construed to mean:

First. Every person in the service of the State, county, city, town, township, incorporated village, or school district, body politic, or municipal corporations therein, under appointment, or contract of hire, express or implied, oral or written, except any official of the State, or of any county, city, town, township, incorporated village, school district, body politic, or municipal corporation therein; and except any employee thereof for whose accidental injury or death arising out of and in the course of his employment compensation or a pension shall be payable to him, his personal representatives, beneficiaries, or heirs, from any pension or benefit fund to which the State, or any county, city, town, township, incorporated village, school district, body politic, or municipal corporation therein contributes in whole or in part: Provided, That one employed by a contractor who has contracted with the State, or a county, city, town, township, incorporated village, school district, body politic, or municipal corporation therein, through its representatives, shall not be considered as an employee of the State, county, city, town, township, incorporated village, school district, body politic, or municipal corporation which made the contract.

Second. Every person in the service of another under any contract of hire, express or implied, oral or written, including aliens, and minors who are legally permitted to work under the laws of the State, who, for the purpose of this act, shall be considered the same and have the same power to contract, receive payments and give quittances therefor, as adult employees, but not including any person whose employment is but casual or who is not engaged in the usual course of the trade, business, profession, or occupation of his employer: Provided, That employees shall not be included within the provisions of this act when excluded by the laws of the United States relating to liability of employers to their employees for personal injuries where such laws are held to be exclusive.

Sec. 6. No common law or statutory right to recover damages for injury or death sustained by any employee while engaged in the line of his duty as such employee other than the compensation herein provided shall be available to any employee who is covered by the provisions of this act, to any one wholly or partially dependent upon him, the legal representatives of his estate, or any one otherwise entitled to recover damages for such injury.

Sec. 7. The amount of compensation which shall be paid for an injury to the employee resulting in death shall be:

(a) If the employee leaves any widow, child or children whom he was under legal obligation to support at the time of his injury, a sum equal to four times the average annual earnings of the employee, but not less in any event than one thousand five hundred dollars and not more in any event than three thousand five hundred dollars. Any compensation payments other than necessary medical, surgical or hospital fees or services shall be deducted in ascertaining the amount payable on death.

(b) If no amount is payable under paragraph (a) of this section and the employee leaves any widow, child, parent, grandparent or other lineal heir, to whose support he had contributed within four years previous to the time of his

For the loss of an arm, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during two hundred weeks;

For the loss of a foot, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and twenty-five weeks;

For the loss of a leg, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and seventy-five weeks;

For the loss of the sight of an eye, fifty per centum of the average weekly wage during one hundred weeks;

The loss of both hands or both arms, or both feet, or both legs, or both eyes, or of any two thereof, shall constitute total and permanent disability, to be compensated according to the compensation fixed by paragraph (f) of this section: Provided, That these specific cases of total and permanent disability shall not be construed as excluding other cases.

(f) In the case of complete disability which renders the employee wholly and permanently incapable of work, compensation equal to 50 per cent of his earnings, but not less than \$5.00, nor more than \$12.00 per week, commencing on the day after the injury and continuing until the amount paid equals the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7, and thereafter a pension during life annually equal to 8 per cent of the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7. Such pension shall not be less than \$10.00 per month and shall be payable monthly.

(g) In case death occurs as a result of the injury before the total of the payments made equals the amount payable as a death benefit, then in case the employee leaves any widow, child or children, parents, grandparents or other lineal heirs, entitled to compensation under section 7, the difference between the compensation for death and the sum of the payments, made to the employee shall be paid at the option of the employer either to the personal representative or the beneficiaries of the deceased employee and distributed, as provided in paragraph (f) of section 7, but in no case shall the amount payable under this paragraph be less than \$500.00.

(h) In no event shall the compensation to be paid exceed fifty per centum of the average weekly wage or exceed twelve dollars per week in amount; nor, except in cases of complete disability as defined above shall any payments extend over a period of more than eight years from the date of the accident. In case an injured employee shall be incompetent at the time when any right or privilege accrues to him under the provisions of this Act, a conservator or guardian may be appointed pursuant to law, and may, on behalf of such incompetent claim and exercise any such right or privilege with the same force and effect as if the employee himself had been competent and had claimed or exercised said right or privilege; and no limitations of time by this Act provided shall run so long as said incompetent employee is without a conservator or guardian.

(i) All compensation provided for in paragraphs (b), (c), (d), (e) and (f) of this section, other than cases of pension for life, shall be paid in installments at the same intervals at which the wages or earnings of the employee were paid at the time of the injury, or if this shall not be feasible, then the installments shall be paid weekly. (Amended. See page 420.)

time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7: Provided, that no compensation shall be payable under this paragraph where compensation is payable under paragraphs (d), (e), or (f) of this section.

(d) If, after the injury has been sustained, the employee as a result thereof becomes partially, though permanently incapacitated from pursuing his usual and customary line of employment, he shall, except in the cases covered by the specific schedule set forth in paragraph (e) of this section, receive compensation, subject to the limitations as to time and maximum amounts fixed in paragraphs (b) and (h) of this section, equal to one-half of the difference between the average amount which he earned before the accident, and the average amount which he is earning or is able to earn in some suitable employment or business after the accident. In the event the employee returns to the employment of the employer in whose service he was injured, the employee shall not be barred from asserting a claim for compensation under this Act: Provided, notice of such claim is filed with the Industrial Board within eighteen months after he returns to such employment, and the said board shall immediately send to the employer by registered mail, a copy of such notice.

(e) For injuries in the following schedule, the employee shall receive in addition to compensation during the period of temporary total incapacity for work resulting from such injury, in accordance with the provisions of paragraphs (a) and (b) of this section, compensation, for a further period subject to the limitations as to time and amounts fixed in paragraphs (b) and (h) of this section, for the specific loss herein mentioned, as follows, but shall not receive any compensation under any other provisions of this Act.

For the loss of a thumb, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during sixty weeks;

For the loss of a first finger, commonly called the index finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during thirty-five weeks;

For the loss of a second finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wages during thirty weeks;

For the loss of a third finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during twenty weeks;

For the loss of a fourth finger, commonly called the little finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during fifteen weeks;

The loss of the first phalange of the thumb, or of any finger, shall be considered to be equal to the loss of one-half of such thumb, or finger, and compensation shall be one-half the amounts above specified;

The loss of more than one phalange shall be considered as the loss of the entire finger or thumb: Provided, however, That in no case shall the amount received for more than one finger exceed the amount provided in this schedule for the loss of a hand;

For the loss of a great toe, fifty per centum of the average weekly wage during thirty weeks;

For the loss of one or more of the toes other than the great toe, fifty per centum of the average weekly wage during ten weeks;

The loss of the first phalange of any toe shall be considered to be equal to the loss of one-half of such toe, and compensation shall be one-half of the amount above specified;

The loss of more than one phalange shall be considered as the loss of the entire toe;

For the loss of a hand, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and fifty weeks;

For the loss of an arm, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during two hundred weeks;

For the loss of a foot, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and twenty-five weeks;

For the loss of a leg, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and seventy-five weeks;

For the loss of the sight of an eye, fifty per centum of the average weekly wage during one hundred weeks;

The loss of both hands or both arms, or both feet, or both legs, or both eyes, or of any two thereof, shall constitute total and permanent disability, to be compensated according to the compensation fixed by paragraph (f) of this section: Provided, That these specific cases of total and permanent disability shall not be construed as excluding other cases.

(f) In the case of complete disability which renders the employee wholly and permanently incapable of work, compensation equal to 50 per cent of his earnings, but not less than \$5.00, nor more than \$12.00 per week, commencing on the day after the injury and continuing until the amount paid equals the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7, and thereafter a pension during life annually equal to 8 per cent of the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7. Such pension shall not be less than \$10.00 per month and shall be payable monthly.

(g) In case death occurs as a result of the injury before the total of the payments made equals the amount payable as a death benefit, then in case the employee leaves any widow, child or children, parents, grandparents or other lineal heirs, entitled to compensation under section 7, the difference between the compensation for death and the sum of the payments, made to the employee shall be paid at the option of the employer either to the personal representative or the beneficiaries of the deceased employee and distributed, as provided in paragraph (f) of section 7, but in no case shall the amount payable under this paragraph be less than \$500.00.

(h) In no event shall the compensation to be paid exceed fifty per centum of the average weekly wage or exceed twelve dollars per week in amount; nor, except in cases of complete disability as defined above shall any payments extend over a period of more than eight years from the date of the accident. In case an injured employee shall be incompetent at the time when any right or privilege accrues to him under the provisions of this Act, a conservator or guardian may be appointed pursuant to law, and may, on behalf of such incompetent claim and exercise any such right or privilege with the same force and effect as if the employee himself had been competent and had claimed or exercised said right or privilege; and no limitations of time by this Act provided shall run so long as said incompetent employee is without a conservator or guardian.

(i) All compensation provided for in paragraphs (b), (c), (d), (e) and (f) of this section, other than cases of pension for life, shall be paid in installments at the same intervals at which the wages or earnings of the employee were paid at the time of the injury, or if this shall not be feasible, then the installments shall be paid weekly. (Amended. See page 420.)

SEC. 9. Any employer or employee or beneficiary, who shall desire to have such compensation, or any unpaid part thereof, paid in a lump sum, may petition the Industrial Board, asking that such compensation be so paid, and if upon proper notice to the interested parties and a proper showing made before such board, it appears to the best interest of the parties that such compensation be so paid, the board shall order the commutation of the compensation to an equivalent lump sum, which commutation shall be an amount which will equal the total sum of the probable future payments capitalized at their present value upon the basis of interest calculated at three per centum per annum with annual rests: Provided, that in cases indicating complete disability no petition for a commutation to a lump sum basis shall be entertained by the Industrial Board until after the expiration of six months from the date of the injury, and where necessary, upon proper application being made, a guardian, conservator or administrator, as the case may be, may be appointed for any person under disability who may be entitled to any such compensation, and an employer bound by the terms of this Act, and liable to pay such compensation, may petition for the appointment of the public administrator, or a conservator, or guardian where no legal representative has been appointed or is acting for such party or parties so under disability: Provided, further, that if the amount awarded as a lump sum settlement is not satisfactory to either party, such party may reject the same within ten days after notice of the award by filing his written rejection thereof with the said board in which event compensation shall be payable in installments as herein provided. (Amended. See page 423.)

SEC. 10. The basis for computing the compensation provided for in sections 7 and 8 of the act shall be as follows:

(a) The compensation shall be computed on the basis of the annual earnings which the injured person received as salary, wages, or earnings if in the employment of the same employer continuously during the year next preceding the injury.

(b) Employment by the same employer shall be taken to mean employment by the same employer in the grade in which the employee was employed at the time of the accident, uninterrupted by absence from work due to illness or any other unavoidable cause.

(c) If the injured person has not been engaged in the employment of the same employer for the full year immediately preceding the accident, the compensation shall be computed according to the annual earnings which persons of the same class in the same employment and same location (or if that be impracticable, of neighboring employments of the same kind) have earned during such period.

(d) As to employees in employments in which it is the custom to operate throughout the working-days of the year, the annual earnings, if not otherwise determinable, shall be regarded as 300 times the average daily earnings in such computation.

(e) As to employees in employments in which it is the custom to operate for a part of the whole number of working-days in each year, such number, if the annual earnings are not otherwise determinable, shall be used instead of 300 as a basis for computing the annual earnings: Provided, The minimum number of days which shall be so used for the basis of the year's work shall be not less than 200.

(f) In the case of injured employees who earn either no wage or less than the earnings of adult day laborers in the same line of employment in that locality, the yearly wage shall be reckoned according to the average annual earnings of adults of the same class in the same (or if that is impracticable then of neighboring) employments.

(g) Earnings, for the purpose of this section, shall be based on the earnings for the number of hours commonly regarded as a days' work for that employment, and shall exclude overtime earnings. The earnings shall not include any sum which the employer has been accustomed to pay the employee to cover any special expense entailed on him by the nature of his employment.

(h) In computing the compensation to be paid to any employee, who, before the accident for which he claims compensation, was disabled and drawing compensation under the terms of this act, the compensation for each subsequent injury shall be apportioned according to the proportion of incapacity and disability caused by the respective injuries which he may have suffered.

(i) To determine the amount of compensation for each installment period, the amount per annum shall be ascertained pursuant hereto, and such amount divided by the number of installment periods per annum.

Sec. 11. The compensation herein provided, together with the provisions of this act, shall be the measure of the responsibility which the employer has assumed for injuries or death that may occur to employees in his employment subject to the provisions of this act. (Amended. See page 455.)

Sec. 12. An employee entitled to receive disability payments shall be required, if requested by the employer, to submit himself at the expense of the employer for examination to a duly qualified medical practitioner or surgeon selected by the employer, at a time and place reasonably convenient for the employee, as soon as practicable after the injury, and also one week after the first examination, and thereafter at intervals not oftener than once every four weeks, which examination shall be for the purpose of determining the nature, extent and probable duration of the injury received by the employee, and for the purpose of ascertaining the amount of compensation which may be due the employee from time to time for disability according to the provisions of this act; Provided, however, That such examination shall be made in the presence of a duly qualified medical practitioner or surgeon provided and paid for by the employee if such employee so desires. If the employee refuses so to submit himself to examination or unnecessarily obstructs the same, his right to compensation payments shall be temporarily suspended until such examination shall have taken place, and no compensation shall be payable under this act for such period. (Amended. See page 423.)

Sec. 13. There is hereby created a board which shall be known as the Industrial Board, to consist of three members to be appointed by the governor, by and with the consent of the senate, one of whom shall be a representative citizen of the employing class operating under this act, and one of whom shall be a representative citizen chosen from among the employees operating under this act, and one of whom shall be a representative citizen not identified with either the employing or employee classes, and who shall be designated by the governor as chairman. Appointment of members to places on the first board, or to fill vacancies on said board may be made during recesses of the senate, but shall be subject to confirmation by the senate at the next ensuing session of the legislature. The term of office of members of this board shall be six years, except that when first constituted one member shall be appointed for two years, one for four years, and one for six years. Thereafter one member shall be appointed every second year for the full term of six years. Not more than two members of the board shall belong to the same political party. (Amended. See pages 424, 455.)

Sec. 14. The salary of each of the members of the board so appointed by the governor shall be \$4,000 per year. The board shall appoint a secretary and shall employ such assistants and clerical help as may be necessary. The board shall provide itself with a seal for the authentication of its orders, awards,

and proceedings, upon which shall be inscribed the words "Industrial board—Illinois—Seal." (Amended. See page 424.)

Sec. 15. The Industrial Board shall have jurisdiction over the operation and administration of this act, and said board shall perform all the duties imposed upon it by this act, and such further duties as may hereafter be imposed by law and the rules of the board not inconsistent therewith.

Sec. 16. The board may make rules and orders for carrying out the duties imposed upon it by law, which rules and orders shall be deemed prima facie reasonable and valid; and the process and procedure before the board shall be as simple and summary as reasonably may be. The board or any member thereof shall have the power to administer oaths, subpoena and examine witnesses, and to examine and inspect such books, papers and records, places or premises as may relate to questions in dispute. (Amended. See page 424.)

Sec. 17. The board shall cause to be printed and furnish free of charge upon request by any employer or employee such blank forms as it shall deem requisite to facilitate or promote the efficient administration of this act, and the performance of the duties of the board; it shall provide a proper record in which shall be entered and indexed the name of any employer who shall file a notice of declination or withdrawal under this act, and the date of the filing thereof; and a proper record in which shall be entered and indexed the name of any employee who shall file such a notice of declination or withdrawal, and the date of the filing thereof; and such other notices as may be required by the terms and intentment of this act; and records in which shall be recorded all proceedings, orders, and awards had or made by the board, or by the arbitration committees, and such other books or records as it shall deem necessary, all such records to be kept in the office of the board.

Sec. 18. All questions arising under this act, if not settled by agreement of the parties interested therein, shall, except as otherwise provided, be determined by the Industrial Board.

Sec. 19. Any disputed questions of law or fact upon which the employer and employee or personal representative can not agree, shall be determined as herein provided.

(a) It shall be the duty of the Industrial Board, upon notification that the parties have failed to reach an agreement, to notify both parties to appoint their respective representatives on a committee of arbitration. The board shall designate one of its members or an agent appointed by it and at its expense to act as chairman, and if either party fails to appoint its member on the committee within seven days after notification as above provided, the board shall appoint a person to fill the vacancy and notify the parties to that effect, and the reasonable expenses of the person so appointed to fill the vacancy shall, after approval by the board, be taxed as costs against the party who failed to appoint its member on such committee.

(b) The committee of arbitration shall make such inquiries and investigations as it shall deem necessary, and may examine and inspect all books, papers, records, places or premises relating to the questions in dispute. The hearings of the committee shall be held in the vicinity where the injury occurred, after ten days' notice of the time and place of such hearing shall have been given to each of the parties, and the decision of the committee shall be filed with the Industrial Board, which board shall immediately send to each party a copy of such decision, together with a notification of the time when it was filed, and unless a petition for a review is filed with the board by either party within fifteen days after the receipt by said party of the copy of such decision and notification of time when filed, and unless such party petitioning for review

shall, within twenty days of the filing of such decision, file with the board either an agreed statement of the facts appearing upon the hearing before the committee of arbitration, or, if such party shall so elect, a correct stenographic report of the proceedings at such hearing, then the decision shall be entered of record as the decision of the Industrial Board: Provided, that such Industrial Board may, for sufficient cause shown, grant further time in which to petition for such review or to file such agreed statement or stenographic report. An agreed statement of facts or correct stenographic report, as the case may be, shall be authenticated by the signatures of the parties or their attorneys and in the event they do not agree as to the correctness of the stenographic report it shall be authenticated by the signature of the chairman of the committee of arbitration.

(c) The Industrial Board may appoint, at its expense, a duly qualified, impartial physician, to examine the injured employee and report to the board. The fee for this service shall not exceed five dollars and traveling expenses, but the board may allow additional reasonable amount in extraordinary cases. The fees and the payment thereof of all attorneys and physicians for services authorized by the board under this Act, shall, upon request of either the employer or the employee or the beneficiary affected, be subject to the review and decision of the Industrial Board.

(d) If any employee shall persist in insanitary or injurious practices which tend to either imperil or retard his recovery or shall refuse to submit to such medical or surgical treatment as is reasonably essential to promote his recovery, the board may, in its discretion, reduce or suspend the compensation of any such injured employee.

(e) If a petition for review, and agreed statement of facts or stenographic report is filed, as provided herein, the Industrial Board shall promptly review the decision of the committee of arbitration and the facts as they appear from the said statement of facts or stenographic report, and shall also, if desired, hear the parties, together with such additional evidence as they may wish to submit. After such hearing upon review, the board shall announce and file in its office its decision thereon and shall immediately send to each party a copy of such decision, together with a notification of the time when it was filed. Such review and hearing may be held in its office, or elsewhere, as the board shall deem advisable. Any party may, within twenty days of the receipt by it of notice of the board's decision or within such further time as the board may grant, file with the board either an agreed statement of the facts appearing upon the hearing, or, if such party shall so elect, a correct stenographic report of the proceedings at the hearing, such statement of facts or stenographic report to be authenticated by the signatures of the parties or their attorneys, and in the event they do not agree then the authentication shall be by the signature of the chairman of the board. The statement of facts or stenographic report of the proceedings on the hearings before either the committee of arbitration or the Industrial Board shall, upon filing as hereinbefore provided, become part of the record of the proceedings of said board.

(f) The decision of the Industrial Board, acting within its powers, according to the provisions of paragraph (e) of this section, and of the committee of arbitration, where no review is had and its decision becomes the decision of the Industrial Board in accordance with the provisions of this section, shall, in the absence of fraud, be conclusive, but the Supreme Court shall have power to review questions of law involved in any such decision: Provided, that application is made by the aggrieved party within thirty days after notice given to him of such decision or within thirty days after the expiration of the time

allowed for filing the agreed statement of facts or stenographic report with said board, by certiorari, mandamus or by any other method permissible under the rules and practices of said court or the laws of this State.

The decision of any two members of a committee of arbitration, or of the industrial board, shall be considered the decision of such committee or board, respectively.

(g) Either party may present a certified copy of the decision of the industrial board, when no proceedings for review thereof have been taken, or of the decision of such committee of arbitration when no claim for review is made, or of the decision of the industrial board after hearing upon review, providing for the payment of compensation according to this act, to the circuit court of the county in which such accident occurred, whereupon such court shall render a judgment in accordance therewith; and in cases where the employer does not institute proceedings for review of the decision of the industrial board and refuses to pay compensation according to the award upon which such judgment is entered, the court shall, in entering judgment thereon, tax as costs against him the reasonable costs and attorney fees in the arbitration proceedings and in the court entering the judgment, for the person in whose favor the judgment is entered; which judgment, and costs, taxed as herein provided, shall, until and unless set aside, have the same effect as though duly rendered in an action duly tried and determined by said court, and shall, with like effect, be entered and docketed. The circuit court shall have power at any time, upon application, to make any such judgment conform to any modification required by any subsequent decision of the supreme court upon appeal, or as the result of any subsequent proceedings for review as provided in this act. Judgment shall not be entered until fifteen days' notice of the time and place of the application for the entry of judgment shall be served upon the employer by filing such notice with the industrial board; which board shall, in case it has on file the address of the employer or the name and address of its agent upon whom notices may be served, immediately send a copy of the notice to the employer or such designated agent; and no judgment shall be entered in the event the employer shall file with the said board its bond with good and sufficient surety in double the amount of the award conditioned upon the payment of said award in the event the said employer shall fail to prosecute with effect proceedings for review of the decision or the said decision upon review shall be affirmed.

(h) An agreement or award under this act, providing for compensation in installments, may at any time within eighteen months after such agreement or award, be reviewed by the industrial board at the request of either the employer or the employee on the ground that the disability of the employee has subsequently recurred, increased, diminished or ended; and on such review compensation payments may be reestablished, increased, diminished or ended: Provided, That the board shall give fifteen days' notice to the parties of the hearing for review: And, provided further, Any employee, upon any petition for such a review being filed by the employer, shall be entitled to one day's notice for each one hundred miles necessary to be traveled by him in attending the hearings of the board upon said petition, and three days' in addition thereto, and such employee shall, at the discretion of the board, also be entitled to five cents per mile necessarily traveled by him in attending such hearing, not to exceed a distance of 300 miles, to be taxed by the board as costs and deposited with the petition of the employer.

(i) Each party, upon taking any proceedings or steps whatsoever, before any committee of arbitration, industrial board or court, shall file with the industrial board his address or the name and address of an agent upon whom all notices to be given to such party shall be served either personally or by regis-

tered mail addressed to such party or agent at the last address so filed with the industrial board: Provided, That in the event such party has not filed his address or the name and address of an agent as above provided, service of any notice may be had by filing such notice with the industrial board. (Amended. See page 425.)

SEC. 20. The Industrial Board shall report in writing to the governor on the thirtieth day of June, annually, the details and results of its administration of this act, in accordance with the terms of this act, and may prepare and issue such special bulletins and reports from time to time as in the opinion of the board seems advisable.

SEC. 21. No payment, claim, award or decision under this Act shall be assignable or subject to any lien, attachment or garnishment, or be held liable in any way for any lien, debt, penalty or damages. In case of insolvency of the employer, every decision of the Industrial Board for compensation under this Act shall, upon the filing of a certified copy of the decision with the recorder of deeds of a county, constitute a lien upon all property of the employer within said county, paramount to all other claims, or liens except for wages and taxes, and mortgages or trust deeds, and such liens shall be enforced by order of the court. Any right to receive compensation hereunder shall be extinguished by the death of the person or persons entitled thereto, subject to the provisions of this Act relative to compensation for death received in the course of employment. (Amended. See page 428.)

SEC. 22. Any contract or agreement made by any employer or his agent or attorney with any employee or any other beneficiary of any claim under the provisions of this act within seven days after the injury shall be presumed to be fraudulent.

SEC. 23. No employee, personal representative, or beneficiary shall have power to waive any of the provisions of this act in regard to the amount of compensation which may be payable to such employee, personal representative, or beneficiary hereunder except after approval by the Industrial Board.

SEC. 24. No proceedings for compensation under this act shall be maintained unless notice of the accident has been given the employer as soon as practicable, but not later than 30 days after the accident. In cases of mental incapacity of the employee, notice must be given within six months after such accident. No defect or inaccuracy of such notice shall be a bar to the maintenance of proceedings by arbitration or otherwise by the employee, unless the employer proves that he is unduly prejudiced in such proceedings by such defect or inaccuracy. Notice of the accident shall in substance apprise the employer of the claim of compensation made and shall state the name and address of the employee injured, the approximate date and place of the accident, if known, and in simple language the cause thereof; which notice may be served personally or by registered mail, addressed to the employer at his last-known residence or place of business: Provided, That the failure on the part of any person entitled to such compensation to give such notice shall not relieve the employer from his liability for such compensation, when the facts and circumstances of such accident are known to such employer, his agent, or vice principal in the enterprise. No proceedings for compensation under this act shall be maintained unless claim for compensation has been made within six months after the accident, or in the event that payments have been made under the provisions of this act, unless written claim for compensation has been made within six months after such payments have ceased.

SEC. 25. Any employer against whom liability may exist for compensation under this act may, with the approval of the Industrial Board, be relieved therefrom by:

(a) Depositing the commuted value of the total unpaid compensation for which such liability exists, computed at three per centum per annum in the same manner as provided in section 9, with the State treasurer, or county treasurer in the county where the accident happened, or with any State or national bank or trust company doing business in this State, or in some other suitable depository approved by the Industrial Board: Provided, That any such depository to which such compensation may be paid shall pay the same out in installments as in this act provided, unless such sum is ordered paid in, and is commuted to, a lump sum payment in accordance with the provision of this act.

(b) By the purchase of an annuity, in an amount of compensation due or computed, under this act within the limitation provided by law, in any insurance company granting annuities and licensed or permitted to do business in this State, which may be designated by the employer or the Industrial Board.

SEC. 26. (a) An employer who elects to provide and pay the compensation provided for in this act shall within ten (10) days of receipt by the employer of a written demand by the industrial board (1) file with the board a sworn statement showing his financial ability to pay the compensation provided for in this act, normally required to be paid, or (2) furnish security, indemnity or a bond guaranteeing the payment by the employer of the compensation provided for in this act, normally required to be paid, or (3) insure to a reasonable amount his normal liability to pay such compensation in some corporation, association or organization authorized, licensed or permitted to do such insurance business in this State, or (4) make some other provision for the securing of the payment of compensation provided for in this act, normally required to be paid, and shall within twenty (20) days of the receipt of such written demand furnish to the board evidence of his compliance with one of the above alternatives: Provided, That the sworn statement of financial ability, or security, indemnity or bond, or amount of insurance or other provision, filed, furnished, carried or made by the employer, as the case may be, shall be subject to the approval of the board, upon the approval of which the board shall send to the employer written notice of its approval thereof: And provided, further, That demand shall not be made upon the employer by the board oftener than once in any calendar year.

(b) If no sworn statement or no security, indemnity or bond, or no insurance is filed, furnished or carried, or other provision made by the employer within ten (10) days of receipt by the employer of the written demand provided for in paragraph (a), or if the statement, security, indemnity, bond or amount of insurance filed, furnished or carried, or other provision made by the employer, as provided in paragraph (a), shall not be approved by the board, and written notice of such nonapproval shall be given to the employer and the employer shall not comply with one of the alternatives of paragraph (a) of this section within ten (10) days after the receipt by the employer of such written notice of nonapproval, then the employer shall be liable for compensation to any injured employee or his personal representative, according to the terms of this act, or for damages in the same manner as if the employer had elected not to accept this act, at the option of such employee or his personal representative: Provided, Such option is exercised and written notice thereof is given to the employer within thirty days after the accident to such employee, otherwise the employer shall be liable only for the compensation payable according to the provisions of this act: And, provided, further, That if at any time thereafter the employer shall comply with any of the alternatives of paragraph (a), then as to all accidents occurring after the said compliance, the employer shall only be liable for compensation according to the terms of this act.

(c) "Normal liability" and "normally required to be paid," whenever used herein, shall be measured by the experience, if any, of the said employer during the two years preceding the demand by the board, and if there is no such individual basis of experience, then by the general experience in the same industry, business, occupation or enterprise in the same neighborhood during the same period. (Amended. See pages 429, 455.)

SEC. 27. (a) This act shall not affect or disturb the continuance of any existing insurance, mutual aid, benefit, or relief association or department, whether maintained in whole or in part by the employer or whether maintained by the employees, the payment of benefits of such association or department being guaranteed by the employer or by some person, firm, or corporation for him: Provided, The employer contributes to such association or department an amount not less than the full compensation herein provided, exclusive of the cost of the maintenance of such association or department and without any expense to the employee. This act shall not prevent the organization and maintaining under the insurance laws of this State of any benefit or insurance company for the purpose of insuring against the compensation provided for in this act, the expense of which is maintained by the employer. This act shall not prevent the organization or maintaining under the insurance laws of this State of any voluntary mutual aid, benefit, or relief association among employees for the payment of additional accident or sick benefits.

(b) No existing insurance, mutual aid, benefit, or relief association or department shall, by reason of anything herein contained, be authorized to discontinue its operation without first discharging its obligations to any and all persons carrying insurance in the same or entitled to relief or benefits therein.

(c) Any contract, oral, written, or implied, of employment providing for relief benefit, or insurance or any other device whereby the employee is required to pay any premium or premiums for insurance against the compensation provided for in this act shall be null and void, and any employer withholding from the wages of any employee any amount for the purpose of paying any such premium shall be guilty of a misdemeanor and punishable by a fine of not less than ten dollars nor more than one thousand dollars, or imprisonment in the county jail for not more than six months, or both, in the discretion of the court.

SEC. 28. Any person, who shall become entitled to compensation under the provisions of this act, shall, in the event of his inability to recover such compensation from the employer on account of his insolvency, be subrogated to all the rights of such employer against any insurance company, association, or insurer which may have insured such employer against loss growing out of the compensation required by the provisions of this act to be paid by such employer, and, in such event only, the said insurance company, association, or insurer shall become primarily liable to pay to the employee or his personal representative the compensation required by the provisions of this act to be paid by such employer.

SEC. 29. Where an injury or death for which compensation is payable by the employer under this act was not proximately caused by the negligence of the employer or his employees, and was caused under circumstances creating a legal liability for damages in some person other than the employer to pay damages, such other person having also elected to be bound by this act, then the right of the employee or personal representative to recover against such other person shall be subrogated to his employer, and such employer may bring legal proceedings against such other person to recover the damages sustained, in an amount not exceeding the aggregate amount of compensation payable under this act, by reason of the injury or death of such employee. Where the

Injury or death for which compensation is payable under this act was not proximately caused by the negligence of the employer or his employees and was caused under circumstances creating a legal liability for damages on the part of some person other than the employer to pay damages, such other person having elected not to be bound by this act, then legal proceedings may be taken against such other person to recover damages notwithstanding such employer's payment of or liability to pay compensation under this act, but in such case if the action against such other person is brought by the injured employee or his personal representative and judgment is obtained and paid, or settlement is made with such other person, either with or without suit, then from the amount received by such employee or personal representative there shall be paid to the employer the amount of compensation paid or to be paid by him to such employee or personal representative: Provided, That if the injured employee or his personal representative shall agree to receive compensation from the employer or to institute proceedings to recover the same or accept from the employer any payment on account of such compensation, such employer shall be subrogated to all the rights of such employee or personal representative and may maintain, or in case an action has already been instituted, may continue an action either in the name of the employee or personal representative or in his own name against such other person for a recovery of damages to which but for this section the said employee or personal representative would be entitled, but such employer shall nevertheless pay over to the injured employee or personal representative all sums collected from such other person by judgment or otherwise in excess of the amount of such compensation paid or to be paid under this act and all costs, attorneys' fees, and reasonable expenses incurred by such employer in making such collection and enforcing such liability. (Amended. See page 455.)

SEC. 30. It shall be the duty of every employer within the provisions of this act to send to the Industrial Board in writing an immediate report of all accidental injuries arising out of or in the course of the employment and resulting in death; it shall also be the duty of every such employer to report between the 15th and the 25th of each month to the Industrial Board all accidental injuries for which compensation has been paid under this act, which injuries entail a loss to the employee of more than one week's time, and in case the injury results in permanent disability, a further report shall be made as soon as it is determined that such permanent disability has resulted or will result from such injury. All reports shall state the date of the injury, including the time of day or night, the nature of the employer's business, the name, address, the age, sex, conjugal condition of the injured person, the specific occupation of the injured person, the direct cause of the injury and the nature of the accident, the character of the injury, the length of disability, and, in case of death, the length of disability before death, the wages of the injured person, whether compensation has been paid to the injured person, or to his legal representative or his heirs or next of kin, the amount of compensation paid, the amount paid for physicians', surgeons', and hospital bills, and by whom paid, and the amount paid for funeral or burial expenses, if known. The making of reports as provided herein shall release the employer covered by the provisions of this act from making such reports to any other officer of the State.

SEC. 31. Any person, firm, or corporation, who undertakes to do or contracts with others to do, or have done for him, them, or it any work enumerated as extra hazardous in paragraph (b) in section 3, requiring employment of employees in, on, or about the premises where he, they, or it as principal or prin-

cipals contract to do such work or any part thereof, and does not require of the person, firm, or corporation undertaking to do such work for said principal or principals, that such person, firm, or corporation undertaking to do such work shall insure his, their, or its liability to pay the compensation provided in this act to his, their, or its employees and any such person, firm, or corporation who creates or carries into operation any fraudulent scheme, artifice, or device to enable him, them, or it to execute such work without such person, firm, or corporation being responsible to the employee, his personal representative, or beneficiary entitled to such compensation under the provisions of this act, such person, firm, or corporation shall be included in the term "employer" and with the immediate employer shall be jointly and severally liable to pay the compensation herein provided for and be subject to all the provisions of this act.

SEC. 32. No right of action for damages at common law, or under any other statute existing at the time of the taking effect of this act shall be affected by this act.

If the provisions of this act relating to compensation for injuries to or death of employees shall be repealed or adjudged invalid or unconstitutional, the period intervening between the occurrence of an injury or death and such repeal or final adjudication of invalidity shall not be computed as a part of the time limited by law for the commencement of any action relating to such injury or death, but the amount of any compensation which may have been paid for any such injury shall be deducted from any judgment for damages recovered on account of such injury. Any claim, disagreement, or controversy existing or arising under "an act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment," approved June 10, 1911, in force May 1, 1912, shall be adjusted in accordance with the provisions of said act, notwithstanding the repeal thereof, or may by agreement of the parties be adjusted in accordance with the method of procedure provided in this act for the adjustment of differences, jurisdiction to adjust such differences so submitted by the parties being hereby conferred upon the Industrial Board or committee of arbitration provided for in this act. (Amended. See page 455.)

SEC. 33. Any willful neglect, refusal, or failure to do the things required to be done by any section, clause, or provision of this act on the part of the persons herein required to do them, or any violation of any of the provisions or requirements hereof, or any attempt to obstruct or interfere with any court officer or any other person charged with the duty of administering or enforcing the provisions of this act shall be deemed a misdemeanor, punishable by a fine of not less than \$10 nor more than \$500 at the discretion of the court.

SEC. 34. The invalidity of any portion of this act shall in no way affect the validity of any other portion thereof which can be given effect without such invalid part.

SEC. 35. That an act to promote the general welfare of the State of Illinois by providing compensation for accidental injuries or death suffered in the course of employment, approved June 10, 1911, in force May 1, 1912, be, and the same is hereby repealed.

WORKMEN'S COMPENSATION—AMENDATORY ACT.

LAWS 1915, P. 406.

JUNE 26, 1915.

AN ACT to amend section 3, section 7, section 8, section 9, section 12, section 13, section 14, section 16, section 19, section 21, and section 26 of an Act entitled "An Act," etc. (same as in section 1.) (Sections amended. See page 445.)

SECTION 1. Be it enacted, etc.: That section 3, section 7, section 8, section 9, section 12, section 13, section 14, section 16, section 19, section 21, and section 26

of an Act entitled, "An Act to promote the general welfare of the people of this State by providing the compensation for accidental injuries or death suffered in the course of employment within this State; providing for the enforcement and administering thereof, and a penalty for its violation, and repealing an Act entitled, 'An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment,' approved June 10, 1911, in force May 1, 1912," approved June 23, 1913, in force July 1, 1913, be amended and a new section, 33½, be added thereto so as to read as follows:

Sec. 3. (a) In any action to recover damages against an employer engaged in any of the occupations, enterprises, or businesses enumerated in paragraph (b) of this section, who shall elect not to provide and pay compensation to any employee, according to the provisions of this act, it shall not be a defense that: First, the employee assumed the risks of the employment; second, the injury or death was caused in whole or in part by the negligence of a fellow servant; or third, the injury or death was proximately caused by the contributory negligence of the employee.

(b) The provisions of paragraph (a) of this section shall only apply to an employer engaged in any of the following occupations, enterprises, or businesses, namely:

1. The building, maintaining, removing, repairing, or demolishing of any structure, except as provided in subsection 8 of this section;

2. Construction, excavating, or electrical work, except as provided in subsection 8 of this section;

3. Carriage by land or water and loading or unloading, in connection therewith;

4. The operation of any warehouse or general or terminal storehouses;

5. Mining, surface mining, or quarrying;

6. Any enterprise in which explosive materials are manufactured, handled, or used in dangerous quantities;

7. In any enterprise wherein molten metal, or explosive, or injurious gases or vapors, or inflammable vapors or fluids, or corrosive acids are manufactured, used, generated, stored, or conveyed in dangerous quantities;

8. In any enterprise in which statutory or municipal ordinance regulations are now or shall hereafter be imposed for the regulating, guarding, use, or the placing of machinery or appliances, or for the protection and safeguarding of the employees or the public therein; each of which occupations, enterprises, or businesses are hereby declared to be extra hazardous: Provided, Nothing contained herein shall be construed to apply to any work, employment, or operations done, had, or conducted by farmers and others engaged in farming, tillage of the soil, or stock raising, or to those who rent, demise, or lease land for any of such purposes, or to anyone in their employ or to any work done on a farm or country place, no matter what kind of work or service is being done or rendered. (Amended. See page 455.)

Sec. 7. The amount of compensation which shall be paid for an injury to the employee resulting in death shall be:

- (a) If the employee leaves any widow, child, or children whom he was under legal obligation to support at the time of his injury, a sum equal to four times the average annual earnings of the employee, but not less in any event than one thousand six hundred fifty dollars and not more in any event than three thousand five hundred dollars. Any compensation payments other than necessary medical, surgical, or hospital fees or services shall be deducted in ascertaining the amount payable on death.

(b) If no amount is payable under paragraph (a) of this section and the employee leaves any widow, child, parent, grandparent, or other lineal heir to whose support he had contributed within four years previous to the time of his injury, a sum equal to four times the average annual earnings of the employee, but not less in any event than one thousand six hundred fifty dollars and not more in any event than three thousand five hundred dollars. Any compensation payments other than necessary medical, surgical, or hospital fees or services shall be deducted in ascertaining the amount payable on death.

(c) If no amount is payable under paragraph (a) or (b) of this section and the employee leaves collateral heirs dependent at the time of the injury to the employee upon his earnings, such a percentage of the sum provided in paragraph (a) of this section as the average annual contributions which the deceased made to the support of such collateral dependent heirs during the two years preceding the injury bears to his average annual earnings during such two years.

(d) If no amount is payable under paragraph (a) or (b) or (c) of this section, a sum not to exceed one hundred and fifty dollars for burial expenses.

(e) All compensation, except for burial expenses, provided for in this section to be paid in case injury results in death shall be paid in installments equal to one-half the average earnings at the same intervals at which the wages or earnings of the employee were paid, or if this shall not be feasible, then the installments shall be paid weekly: Provided, such compensation may be paid in a lump sum upon petition as provided in section 9 of this act.

(f) The compensation to be paid for injury which results in death, as provided in this section, shall be paid at the option of the employer either to the personal representative of the deceased employee or to his beneficiaries, and shall be distributed to the heirs who formed the basis for determining the amount of compensation to be paid by the employer, the distributees' share to be in the proportion of their respective dependency at the time of the injury on the earnings of the deceased: Provided, that, in the judgment of the court appointing the personal representative, a child's distributive share may be paid to the parent for the support of the child. The payment of compensation by the employer to the personal representative of the deceased employee shall relieve him of all obligations as to the distribution of such compensation so paid. The distribution by the personal representative of the compensation paid to him by the employer shall be made pursuant to the order of the court appointing him.

Sec. 8. The amount of compensation which shall be paid to the employee for an injury not resulting in death shall be:

(a) The employer shall provide necessary first aid, medical, surgical, and hospital services; also medical, surgical, and hospital services for a period not longer than eight weeks, not to exceed, however, the amount of \$200. The employee may elect to secure his own physician, surgeon, or hospital services at his own expense.

(b) If the period of temporary total incapacity for work lasts for more than six working-days, compensation equal to one-half the earnings, but not less than \$6 nor more than \$12 per week, beginning on the eighth day of such temporary total incapacity and continuing as long as the temporary total incapacity lasts, but not after the amount of compensation paid equals the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving as provided in said paragraph (a), section 7.

(c) For any serious and permanent disfigurement to the hand, head, or face the employee shall be entitled to compensation for such disfigurement, the

amount to be fixed by agreement or by arbitration in accordance with the provisions of this act, which amount shall not exceed one-quarter of the amount of the compensation which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7: Provided, That no compensation shall be payable under this paragraph where compensation is payable under paragraphs (d), (e), or (f) of this section: And provided further, That when the disfigurement is to the hand, head, or face as a result of an injury, for which injury compensation is not payable under paragraphs (d), (e), or (f) of this section, compensation for such disfigurement may be had under this paragraph.

(d) If after the injury has been sustained the employee as a result thereof becomes partially incapacitated from pursuing his usual and customary line of employment, he shall, except in the cases covered by the specific schedule set forth in paragraph (e) of this section, receive compensation, subject to the limitations as to time and maximum amounts fixed in paragraphs (b) and (h) of this section, equal to one-half of the difference between the average amount which he earned before the accident and the average amount which he is earning or is able to earn in some suitable employment or business after the accident. In the event the employee returns to the employment of the employer in whose service he was injured, the employee shall not be barred from asserting a claim for compensation under this act: Provided, Notice of such claim is filed with the Industrial Board within eighteen months after he returns to such employment, and the said board shall immediately send to the employer, by registered mail, a copy of such notice.

(e) For injuries in the following schedule the employee shall receive in addition to compensation during the period of temporary total incapacity for work resulting from such injury, in accordance with the provisions of paragraphs (a) and (b) of this section, compensation for a further period, subject to the limitations as to time and amounts fixed in paragraphs (b) and (h) of this section, for the specific loss herein mentioned, as follows, but shall not receive any compensation under any other provision of this act:

For the loss of a thumb, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during sixty weeks;

For the loss of a first finger, commonly called the index finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during thirty-five weeks;

For the loss of a second finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during thirty weeks;

For the loss of a third finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during twenty weeks;

For the loss of a fourth finger, commonly called the little finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during fifteen weeks;

The loss of the first phalange of the thumb, or of any finger, shall be considered to be equal to the loss of one-half of such thumb or finger, and compensation shall be one-half the amounts above specified;

The loss of more than one phalange shall be considered as the loss of the entire finger or thumb: Provided, however, That in no case shall the amount received for more than one finger exceed the amount provided in this schedule for the loss of a hand;

For the loss of a great toe, fifty per centum of the average weekly wage during thirty weeks;

For the loss of one toe other than the great toe, fifty per centum of the average weekly wage during ten weeks, and for the additional loss of one or more toes other than the great toe, fifty per centum of the average weekly wage during an additional ten weeks;

The loss of the first phalange of any toe shall be considered to be equal to the loss of one-half of such toe, and compensation shall be one-half of the amount above specified;

The loss of more than one phalange shall be considered as the loss of the entire toe;

For the loss of a hand, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and fifty weeks;

For the loss of an arm, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during two hundred weeks;

For the loss of a foot, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and twenty-five weeks;

For the loss of a leg, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and seventy-five weeks;

For the loss of the sight of an eye, fifty per centum of the average weekly wage during one hundred weeks;

The loss of both hands, or both arms, or both feet, or both legs, or both eyes, or of any two thereof, shall constitute total and permanent disability, to be compensated according to the compensation fixed by paragraph (f) of this section: Provided, That these specific cases of total and permanent disability shall not be construed as excluding other cases.

(f) In case of complete disability, which renders the employee wholly and permanently incapable of work, compensation equal to 50 per cent of his earnings, but not less than \$6 nor more than \$12 per week, commencing on the day after the injury and continuing until the amount paid equals the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7, and thereafter a pension during life annually equal to 8 per cent of the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7. Such pension shall not be less than \$10 per month and shall be payable monthly.

(g) In case death occurs as a result of the injury before the total of the payments made equals the amount payable as a death benefit, then in case the employee leaves any widow, child or children, parents, grandparents, or other lineal heirs entitled to compensation under section 7, the difference between the compensation for death and the sum of the payments made to the employee shall be paid, at the option of the employer, either to the personal representative or to the beneficiaries of the deceased employee, and distributed, as provided in paragraph (f) of section 7, but in no case shall the amount payable under this paragraph be less than \$500.

(h) In no event shall the compensation to be paid exceed fifty per centum of the average weekly wage or exceed \$12 per week in amount; nor, except in cases of complete disability as defined above, shall any payments extend over a period of more than eight years from the date of the accident. In case an injured employee shall be incompetent at the time when any right or privilege accrues to him under the provisions of this act, a conservator or

guardian may be appointed, pursuant to law, and may, on behalf of such incompetent, claim and exercise any such right or privilege with the same force and effect as if the employee himself had been competent and had claimed or exercised said right or privilege; and no limitations of time by this act provided shall run so long as said incompetent employee is without a conservator or guardian.

(1) All compensations provided for in paragraphs (b), (c), (d), (e), and (f) of this section, other than cases of pension for life, shall be paid in installments at the same intervals at which the wages or earnings of the employee were paid at the time of the injury, or if this shall not be feasible, then the installments shall be paid weekly.

Sec. 9. Any employer or employee or beneficiary who shall desire to have such compensation, or any unpaid part thereof, paid in a lump sum, may petition the Industrial Board, asking that such compensation be so paid, and if, upon proper notice to the interested parties and a proper showing made before such board, it appears to the interest of the parties that such compensation be so paid, the board may order the commutation of the compensation to an equivalent lump sum which commutation shall be an amount which will equal the total sum of the probable future payments capitalized at their present value upon the basis of interest calculated at three per centum per annum, with annual rests: Provided, That in cases indicating complete disability no petition for a commutation to a lump-sum basis shall be entertained by the Industrial Board until after the expiration of six months from the date of the injury, and where necessary, upon proper application being made, a guardian, conservator, or administrator, as the case may be, may be appointed for any person under disability who may be entitled to any such compensation, and an employer bound by the terms of this act and liable to pay such compensation may petition for the appointment of the public administrator, or a conservator, or guardian, where no legal representative has been appointed or is acting for such party or parties so under disability. Either party may reject an award of a lump-sum payment of compensation, except an award for compensation under section 7 or paragraph (e) of section 8 or for the injuries defined in the last paragraph of paragraph (e) of section 8 as constituting total and permanent disability, by filing his written rejection thereof with the said board within ten days after notice to him of the award, in which event compensation shall be payable in installments as herein provided.

-Sec. 12. An employee entitled to receive disability payments shall be required, if requested by the employer, to submit himself, at the expense of the employer, for examination to a duly qualified medical practitioner or surgeon selected by the employer, at a time and place reasonably convenient for the employee, as soon as practicable after the injury, and also one week after the first examination and thereafter at intervals not oftener than once every four weeks, which examination shall be for the purpose of determining the nature, extent, and probable duration of the injury received by the employee, and for the purpose of ascertaining the amount of compensation which may be due the employee from time to time for disability according to the provisions of this act: Provided, however, That such examination shall be made in the presence of a duly qualified medical practitioner or surgeon provided and paid for by the employee, if such employee so desires. In all cases where the examination is made by a surgeon engaged by the employer and the injured employee has no surgeon present at such examination, it shall be the duty of the surgeon making the examination at the instance of the employer to deliver to the injured employee, upon his request or that of his representative, a statement in writing of the condition and extent of the injury to the same extent that said surgeon

reports to the employer. If the employee refuses so to submit himself to examination or unnecessarily obstructs the same, his right to compensation payments shall be temporarily suspended until such examination shall have taken place, and no compensation shall be payable under this act for such period. It shall be the duty of surgeons treating an injured employee who is likely to die, and treating him at the instance of the employer, to have called in another surgeon, to be designated and paid for by either the injured employee or by the person or persons who would become his beneficiary or beneficiaries, to make an examination before the death of such injured employee.

SEC. 13. There is hereby created a board, which shall be known as the Industrial Board, to consist of three members to be appointed by the governor, by and with the consent of the senate, one of whom shall be a representative citizen of the employing class operating under this act, and one of whom shall be a representative citizen chosen from among the employees operating under this act, and one of whom shall be a representative citizen not identified with either the employing or employee classes, and who shall be designated by the governor as chairman. Appointment of members to places on the first board or to fill vacancies on said board may be made during recesses of the senate, but shall be subject to confirmation by the senate at the next ensuing session of the legislature. The term of office of members of this board shall be six years, expiring on January 31 of the odd years, except that when first constituted one member shall be appointed for two years, one for four years, and one for six years. Thereafter one member shall be appointed every second year for the full term of six years. Not more than two members of the board shall belong to the same political party. (Amended. See page 455.)

SEC. 14. The salary of each of the members of the board so appointed by the governor shall be five thousand dollars (\$5,000) per year. The board shall appoint a secretary and shall employ such assistants and clerical help as may be necessary. The salary of the arbitrators designated by the board shall be at the rate of eighteen hundred dollars (\$1,800) per year. The members of the board and the arbitrators shall have reimbursed to them their actual traveling expenses and disbursements made or incurred by them in the discharge of their official duties while away from their places of residence in the performance of their duties. The board shall provide itself with a seal for the authentication of its orders, awards, and proceedings, upon which shall be inscribed the words "Industrial Board—Illinois—Seal."

SEC. 16. The board may make rules and orders for carrying out the duties imposed upon it by law, which rules and orders shall be deemed prima facie reasonable and valid; and the process and procedure before the board shall be as simple and summary as reasonably may be. The board, or any member thereof, or any arbitrator designated by said board, shall have the power to administer oaths, subpoena and examine witnesses, to issue subpoenas duces tecum requiring the production of such books, papers, records, and documents as may be evidence of any matter under inquiry, and to examine and inspect the same and such places or premises as may relate to the question in dispute. Said board, or any member thereof, or any arbitrator designated by said board, shall, on written request of either party to the dispute, issue subpoenas for the attendance of such witnesses and production of such books, papers, records, and documents as shall be designated in said applications: Providing, however, That the parties applying for such subpoena shall advance the officer and witness fees provided for in suits pending in the circuit court. Service of such subpoenas shall be made by any sheriff or constable or other person. In case any person refuses to comply with an order of the board or subpoena issued by it or any member thereof, or any arbitrator designated by said board, or

to permit an inspection of places or premises, or to produce any books, papers, records, or documents, or any witness refuses to testify to any matter regarding which he may be lawfully interrogated, the county court of the county in which said hearing or matter is pending, on application of any member of the board or any arbitrator designated by the board, shall compel obedience by attachment proceedings, as for contempt, as in a case of disobedience of the requirements of a subpoena from such court on a refusal to testify therein.

The board, at its expense, shall provide a stenographer to take the testimony and record of proceedings at the hearings before an arbitrator, committee of arbitration, or the board, and said stenographer shall furnish a transcript of such testimony or proceedings to any person requesting it upon payment to him therefor of five cents per one hundred words for the original and three cents per one hundred words for each copy of such transcript.

The board shall have the power to determine the reasonableness and fix the amount of any fee or compensation charged by any person for any service performed in connection with this act or for which payment is to be made under this act or rendered in securing any right under this act.

Sec. 19. Any disputed questions of law or fact upon which the employer and employee or personal representative can not agree shall be determined as herein provided.

(a) It shall be the duty of the Industrial Board, upon notification that the parties have failed to reach an agreement, to designate an arbitrator: Provided, That if the compensation claimed is for a partial permanent or total permanent incapacity or for death, then the dispute may, at the election of either party, be determined by a committee of arbitration, which election for a determination by a committee shall be made by petitioner filing with the board his election in writing with his petition, or by the other party filing with the board his election in writing within five days of notice to him of the filing of the petition, and thereupon it shall be the duty of the Industrial Board, upon either of the parties having filed their election for a committee of arbitration as above provided, to notify both parties to appoint their respective representatives on the committee of arbitration. The board shall designate an arbitrator to act as chairman, and if either party fails to appoint its member on the committee within seven days after notification as above provided, the board shall appoint a person to fill the vacancy and notify the parties to that effect. The party filing his election for a committee of arbitration shall with his election deposit with the board the sum of twenty dollars, to be paid by the board to the arbitrators selected by the parties as compensation for their services as arbitrators, and upon a failure to deposit as aforesaid, the election shall be void and the determination shall be by an arbitrator designated by the board. The members of the committee of arbitration appointed by either of the parties or one appointed by the board to fill a vacancy by reason of the failure of one of the parties to appoint, shall not be a member of the board or an employee thereof.

(b) The arbitrator or committee of arbitration shall make such inquiries and investigations as he or they shall deem necessary, and may examine and inspect all books, papers, records, places, or premises relating to the questions in dispute, and hear such proper evidence as the parties may submit. The hearings before the arbitrator or committee of arbitration shall be held in the vicinity where the injury occurred, after ten days' notice of the time and place of such hearing shall have been given to each of the parties or their attorneys of record. The decision of the arbitrator or committee of arbitration shall be filed with the industrial board, which board shall immediately send to each party or his attorney a copy of such decision, together with a

notification of the time when it was filed, and unless a petition for a review is filed by either party within fifteen days after the receipt by said party of the copy of such decision and notification of time when filed, and unless such party petitioning for a review shall within twenty days after the receipt by him of the copy of said decision, file with the board either an agreed statement of the facts appearing upon the hearing before the arbitrator or committee of arbitration, or if such party shall so elect, a correct stenographic report of the proceedings at such hearings, then the decision shall become the decision of the Industrial Board: Provided, That such Industrial Board may for sufficient cause shown grant further time, not exceeding thirty days, in which to petition for such review or to file such agreed statement or stenographic report. Such agreed statement of facts or correct stenographic report, as the case may be, shall be authenticated by the signatures of the parties or their attorneys, and in the event they do not agree as to the correctness of the stenographic report it shall be authenticated by the signature of the arbitrator designated by the board.

(c) The Industrial Board may appoint at its expense a duly qualified, impartial physician to examine the injured employee and report to the board. The fee for this service shall not exceed five dollars and traveling expenses, but the board may allow additional reasonable amounts in extraordinary cases. The fees and the payment thereof of all attorneys and physicians for services authorized by the board under this act shall, upon request of either the employer or the employee or the beneficiary affected, be subject to the review and decision of the Industrial Board.

(d) If any employee shall persist in insanitary or injurious practices which tend to either imperil or retard his recovery or shall refuse to submit to such medical or surgical treatment as is reasonably essential to promote his recovery, the board may, in its discretion, reduce or suspend the compensation of any such injured employee.

(e) If a petition for review and agreed statement of facts or stenographic report is filed, as provided herein, the Industrial Board shall promptly review the decision of the arbitrator or committee of arbitration and all questions of law or fact which appear from the said statement of facts or stenographic report and such additional evidence as the parties may submit. After such hearing upon review, the board shall file in its office its decision thereon, and shall immediately send to each party or his attorney a copy of such decision and a notification of the time when it was filed. Such review and hearing may be held in its office, or elsewhere, as the board may deem advisable: Provided, The board shall give ten days' notice of the time and place thereof to the parties or their attorneys. In any case, the board in its decision may, in its discretion, find specially upon any question or questions of law or fact, which shall be submitted in writing by either party, whether ultimate or otherwise. Any party may, within twenty days after the receipt of notice of the board's decision, or within such further time, not exceeding thirty days, as the board may grant, file with the board either an agreed statement of the facts appearing upon the hearing, or, if such party shall so elect, a correct stenographic report of the additional proceedings presented before the board, in which report the party may embody a correct statement of such other proceedings in the case as such party may desire to have reviewed, such statement of facts or stenographic report to be authenticated by the signatures of the parties or their attorneys; and in the event that they do not agree, then the authentication of such stenographic report shall be by the signature of the chairman of the board. The applications for adjustment of claim and other documents in the nature of pleadings filed by either party, together with the

decisions of the arbitrator and of the Industrial Board, and the statement of facts or stenographic reports hereinbefore provided for in paragraphs (b) and (c), shall be the record of the proceedings of said board and shall be subject to review as hereinafter provided.

(f) The decision of the Industrial Board, acting within its powers, according to the provisions of paragraph (e) of this section, and of the arbitrator or committee of arbitration, where no review is had and his or their decision becomes the decision of the Industrial Board in accordance with the provisions of this section, shall, in the absence of fraud, be conclusive unless reviewed as in this paragraph hereinafter provided.

(1) The circuit court of the county where any of the parties defendant may be found shall by writ of certiorari to the Industrial Board have power to review all questions of law presented by such record. Such writ shall be issued by the clerk of such court upon praecipe. Service upon any member of the Industrial Board or the secretary thereof shall be by scire facias, or service may be made upon said board and other parties in interest by mailing notice of the commencement of the proceedings and the return day of the writ to the office of said board and the last known place of residence of the other parties in interest at least ten days before the return day of said writ; or (2) any party in interest may commence a suit in chancery in the circuit court of the county where any of the parties defendant may be found to review the decision of the board only for errors of law appearing on the said record of the said board. Such suit by writ of certiorari or in chancery shall be commenced within twenty days of the receipt of notice of the decision of the board.

The court may confirm or set aside the decision of the arbitrator or committee of arbitration or Industrial Board. If the decision is set aside and the facts found in the proceedings before the board are sufficient, the court may enter such decision as is justified by law, or may remand the cause to the Industrial Board for further proceedings, and may state the questions requiring further hearing, and give such other instructions as may be proper.

Judgments, orders, and degrees of the circuit court under this act shall be reviewed only by the supreme court upon writ of error. Upon motion, the trial court shall enter of record a certificate that the cause is or is not, in his opinion, one proper to be reviewed by the supreme court. Upon filing with the clerk of the supreme court a certified copy of such a certificate that the cause is one proper to be reviewed, writ of error shall issue. If the trial court certifies that the cause is not one proper to be reviewed, the supreme court, in its discretion, may, nevertheless, order that a writ of error issue. A writ of error when issued shall operate as a supersedeas.

The decision of any two members of a committee of arbitration or of the Industrial Board shall be considered the decision of such committee or board, respectively.

(g) Either party may present a certified copy of the decision of the Industrial Board when no proceedings for review thereof have been taken, or of the decision of such arbitrator or committee of arbitration when no claim for review is made, or of the decision of the Industrial Board after hearing upon review, providing for the payment of compensation according to this act, to the circuit court of the county in which such accident occurred or either of the parties are residents, whereupon such court shall render a judgment in accordance therewith; and in cases where the employer does not institute proceedings for review of the decision of the Industrial Board and refuses to pay compensation according to the award upon which such judgment is entered, the court shall, in entering judgment thereon, tax as costs against him the reason-

able costs and attorney fees in the arbitration proceedings and in the court entering the judgment, for the person in whose favor the judgment is entered, which judgment and costs, taxed as herein provided, shall, until and unless set aside, have the same effect as though duly rendered in an action duly tried and determined by said court, and shall, with like effect, be entered and docketed. The circuit court shall have power, at any time, upon application, to make any such judgment conform to any modification required by any subsequent decision of the supreme court upon appeal, or as the result of any subsequent proceedings for review, as provided in this act.

Judgment shall not be entered until fifteen days' notice of the time and place of the application for the entry of judgment shall be served upon the employer by filing such notice with the Industrial Board; which board shall, in case it has on file the address of the employer or the name and address of its agent, upon whom notices may be served, immediately send a copy of the notice to the employer or such designated agent; and no judgment shall be entered in the event the employer shall file with the said board its bond, with good and sufficient surety in double the amount of the award, conditioned upon the payment of said award in the event the said employer shall fail to prosecute with effect proceedings for review of the decision, or the said decision upon review, shall be affirmed.

(h) An agreement or award under this act, providing for compensation in installments, may at any time within eighteen months after such agreement or award be reviewed by the Industrial Board at the request of either the employer or the employee, on the ground that the disability of the employee has subsequently recurred, increased, diminished, or ended; and on such review, compensation payments may be reestablished, increased, diminished, or ended: Provided, That the board shall give fifteen days' notice to the parties of the hearing for review: And provided further, Any employee, upon any petition for such a review being filed by the employer, shall be entitled to one day's notice for each one hundred miles necessary to be traveled by him in attending the hearings of the board upon said petition and three days in addition thereto, and such employee shall, at the discretion of the board, also be entitled to five cents per mile necessarily traveled by him in attending such hearing, not to exceed a distance of three hundred miles, to be taxed by the board as costs and deposited with the petition of the employer.

(i) Each party, upon taking any proceedings or steps whatsoever before any arbitrator, committee of arbitration, Industrial Board, or court shall file with the Industrial Board his address or the name and address of an agent upon whom all notices to be given to such party shall be served, either personally or by registered mail addressed to such party or agent at the last address so filed with the Industrial Board: Provided, That in the event such party has not filed his address or the name and address of an agent, as above provided, service of any notice may be had by filing such notice with the Industrial Board.

Sec. 21. No payment, claim, award, or decision under this act shall be assignable or subject to any lien, attachment, or garnishment, or be held liable in any way for any lien, debt, penalty, or damages. In case of insolvency of the employer every decision of the Industrial Board for compensation under this act shall, upon the filing of a certified copy of the decision with the recorder of deeds of the county, constitute a lien upon all property of the employer within said county paramount to all other claims or liens, except for wages and taxes and mortgages or trust deeds, and such liens shall be enforced by order of the court. Any right to receive compensation hereunder shall be extinguished by the death

of the person or persons entitled thereto, subject to the provisions of this act relative to compensation for death received in the course of employment: Provided, That upon the death of a beneficiary who is receiving compensation provided for in section 7, leaving surviving a parent, sister, or brother of the deceased employee, at a time of his death depending upon him for support, who were receiving from such beneficiary a contribution to support, then that proportion of the compensation of the beneficiary which would have been paid but for the death of the beneficiary, but in no event exceeding said unpaid compensation, which the contribution of the beneficiary to the dependent's support within one year prior to the death of the beneficiary bears to the compensation of the beneficiary within that year shall be continued for the benefit of such dependents notwithstanding the death of the beneficiary.

SEC. 26. (a) An employer who elects to provide and pay the compensation provided for in this act shall, within ten (10) days of receipt by the employer of a written demand by the Industrial Board, (1) file with the board a sworn statement showing his financial ability to pay the compensation provided for in this act, normally required to be paid, or (2) furnish security, indemnity, or a bond guaranteeing the payment by the employer of the compensation provided for in this act, normally required to be paid, or (3) insure to a reasonable amount his normal ability to pay such compensation in some corporation, association, or organization authorized, licensed, or permitted to do such insurance business in this State, or (4) make some other provisions for the securing of the payment of compensation provided for in this act, normally required to be paid, and shall, within twenty (20) days of the receipt of such written demand, furnish to the board evidence of his compliance with one of the above alternatives: Provided, That the sworn statement of financial ability, or security, indemnity or bond, or amount of insurance or other provision, filed, furnished, carried, or made by the employer, as the case may be, shall be subject to the approval of the board, upon the approval of which the board shall send to the employer written notice of its approval thereof: And provided further, That demand shall not be made upon the employer by the board oftener than once in any calendar year.

(b) If no sworn statement or no security, indemnity or bond, or no insurance is filed, furnished, or carried, or other provisions made by the employer within ten (10) days of receipt by the employer of the written demand provided for in paragraph (a), or if the statement, security, indemnity, bond, or amount of insurance filed, furnished, or carried, or other provision made by the employer, as provided in paragraph (a), shall not be approved by the board, and written notice of such nonapproval shall be given to the employer and the employer shall not comply with one of the alternatives of paragraph (a) of this section within ten (10) days after the receipt by the employer of such written notice of nonapproval, then the employer shall be liable for compensation to any injured employee, or his personal representative, according to the terms of this act, or for damages in the same manner as if the employer had elected not to accept this act, at the option of such employee or his personal representative: Provided, Such option is exercised and written notice thereof is given to the employer within thirty (30) days after the accident to such employee; otherwise the employer shall be liable only for the compensation payable according to the provisions of this act: And provided further, That if at any time thereafter the employer shall comply with any of the alternatives of paragraph (a), then as to all accidents occurring after the said compliance, the employer shall only be liable for compensation according to the terms of this act: And provided further, That upon the failure of any employer to comply with the provisions of this

section the Industrial Board may, for the purpose of furnishing notice to the employees of such employer, publish the fact of such failure by such employer in any newspaper having a general circulation in the county where such employer does business. (Amended. See page 455.)

SEC. 33½ (added by act, p. 400, Acts of 1915). This act may be cited as the workmen's compensation act.

ANNOTATIONS.

WORKMEN'S COMPENSATION ACT.

1. CONSTITUTIONALITY OF ACT—CLASSIFICATION.
2. CONSTRUCTION AND APPLICATION OF ACT.
3. ELECTION BY EMPLOYER TO PAY COMPENSATION—DEFENSES.
4. ELECTION BY EMPLOYEE—CONDITION.
5. ELECTION BY EMPLOYER AND EMPLOYEE—REMEDY—PRACTICE.
6. ELECTION TO ACCEPT—PRESUMPTION.
7. REJECTION BY EMPLOYER—EFFECT AND LIABILITY—PROOF.
8. REJECTION BY EMPLOYEE—NOTICE.
9. DEFENSES AVAILABLE TO EMPLOYER.
10. MINER'S RIGHT TO RECOVER FOR INJURY—PROOF.
11. CONTRIBUTORY NEGLIGENCE OF MINER—EFFECT ON RECOVERY.
12. PROCEDURE UNDER ACT—ARBITRATION.
13. NOTICE OF INJURY—SUFFICIENCY.
14. DISABILITY—PERMANENT AND PARTIAL—INCREASED—REVIEW.
15. INDUSTRIAL BOARD—JURISDICTION—CONCLUSIVENESS OF FINDING—APPEAL.
16. APPLICATION OF STATUTE.

1. CONSTITUTIONALITY OF ACT—CLASSIFICATION.

The act of 1911, known as the Workmen's Compensation Act, is constitutional.

Crooks v. Tazewell, 263 Ill. 343, p. 347;

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 488;

Frey v. Kerens-Donnewald Coal Co., 271 Ill. 121, p. 125;

French v. Clover Leaf Coal Min. Co., 190 Ill. App. 400, p. 402.

The workmen's compensation act of Illinois is constitutional. It is within the power of the legislature to require an employer guilty of no negligence to pay an injured employee compensation.

Casparis Stone Co. v. Industrial Board, etc., 278 Ill. 77, p. 80;

Inspiration Consol. Copper Co. v. Mendez (Arizona), 166 Pacific 278.

Under the doctrine of equal protection of the law the Federal constitution prohibits class legislation; but there is no prohibition against a reasonable classification of persons and things for the purpose of legislation, but the classification must not be capricious or arbitrary, but must be reasonable and natural and based upon some principle of public policy. If the classification provided is not unreasonable and arbitrary and the statute is uniform in its operation on all the members of a class to which it is made applicable, the equal protection clause of the Federal constitution is satisfied. In the exercise of its power to make classification the legislature is permitted wide range of discretion and the question of classification is primarily with the law-making body and it becomes a judicial question only when the legislative action is clearly unreasonable. The classification provided in the Illinois workmen's compensation act bears a reasonable relation to the object sought to be accom-

plished and is uniform as to all members of the class to which it is made applicable; and it is not unconstitutional because of such classification.

Casparis Stone Co. v. Industrial Board, etc., 278 Illinois 77, p. 80.

2. CONSTRUCTION AND APPLICATION OF ACT.

The difficulty in understanding and applying the provisions of section 1 resulting from the language "to any employee who has elected to accept the provisions of this act," is obviated and the application readily understood by interpolating two negatives in the clause and making it read, "any employee who has not elected to not accept the provisions of this act." The basis of this construction lies in the fact that the law automatically and without any action on their part applies to both employer and employee, and both must, to avoid the provision of the act, give notice of their election not to be bound thereby. Hence an employee would not be required to elect to accept the provisions of the act but it must apply if he has not elected to not accept its provisions.

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 486.

It was manifestly the intention of the legislature to make the act applicable to all employers within the enumerated employment, unless and until notice in writing of their election to the contrary is filed with the State Bureau of Labor Statistics. All employees to whom the act applied were likewise automatically made subject to the law and both employer and employee in the specified employments became subject to the act without any affirmative action on their part. The elective feature of the act is to be exercised to avoid being governed by it and not to cause the act to be applied in any given case.

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 486.

The act of 1911 is not mandatory but elective and when both employer and employee come under the act and are subject to its provisions, the act becomes a part of the contract of employment and enforceable between the parties as such.

Crooks v. Tazewell, 263 Ill. 343, p. 347;

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 484.

Fruit v. Industrial Board, etc., ——— Ill. ———, 119 N. E. 931.

3. ELECTION BY EMPLOYER TO PAY COMPENSATION—DEFENSES.

The employer must first elect whether to pay the compensation fixed by the act or remain liable for damages under the law as it was but deprived of certain defenses. If the employer elects to pay compensation under the act then the employee is also bound by the act, unless within 30 days after the employment he shall file a notice of his rejection of the act. If the employer elects not to accept the provisions of the act then he is penalized by being deprived of the defenses of assumed risk, negligence of a fellow servant, want of ordinary care, or contributory negligence. If the employer elects to pay compensation under the act and the employee elects not to accept compensation and take his right to sue for damages, the employer in any such action may interpose the defenses of assumed risk, negligence of a fellow servant or contributory negligence.

Faxror v. Superior Coal Co., 188 Ill. App. 203, p. 206.

See Bateman v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357;

Price v. Clover Leaf Coal Min. Co., 188 Ill. App. 27, p. 31;

French v. Clover Leaf Coal Min. Co., 190 Ill. App. 400, p. 402;

Cynkus v. Big Muddy Coal & Iron Co., 190 Ill. App. 602, p. 603;

Krisman v. Johnston City & Big Muddy Coal & Iron Co., 190 Ill. App. 612, p. 614.

If an employer elects not to come within the provisions of the act and files the proper notice with the State Bureau of Labor Statistics he is not subject thereto with the single exception that he forfeits his right to interpose the common law defenses of assumed risk, fellow servant and contributory negligence, except that the latter may be shown for the purpose of reducing the damages.

Crooks v. Tazewell, 263 Ill. 343, p. 347;

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 484.

Wendzinski v. Madison Coal Co., ——— Ill. ———, 118 N. E. 435.

4. ELECTION BY EMPLOYEE—CONDITION.

There is no method provided in the statute by which a miner or employee can elect to be governed by the act unless the mine operator or employer has previously exercised his right of election and determined to be governed by the act. It was not the intention of the legislature to put it in the power of the miner or employee to compel the operator or employer to adopt the act without regard to the operator or employers own wishes in the matter.

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 483.

5. ELECTION BY EMPLOYER AND EMPLOYEE—REMEDY—PRACTICE.

Where employer and employee have both elected to come within and be bound by the provisions of the act then, in seeking redress under it the action must be brought pursuant to and in accordance with its terms and provisions.

Crooks v. Tazewell, 263 Ill. 343, p. 348.

See Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480.

Where a coal mine operator has elected to come under the provisions of the act so long as such election remains in force the act is effective as to the parties making election and in case both employer and employee elect to come under its provisions the act itself becomes a part of the contract of employment.

Batemen v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357, p. 364.

See Price v. Clover Leaf Coal Min. Co., 188 Ill. App. 27, p. 31

6. ELECTION TO ACCEPT—PRESUMPTION.

The presumption of law is that both the mine operator and the examiner were governed by the provisions of the workmen's compensation act, unless it is made to appear that one or both of them filed an election to the contrary with the State Bureau of Labor Statistics.

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480;

Krisman v. Johnston City & Big Muddy Coal & Iron Co., 190 Ill. App. 612;

French v. Clover Leaf Coal Min. Co., 190 Ill. App. 400, p. 402;

Cynkus v. Big Muddy Coal & Iron Co., 190 Ill. App. 602, p. 603;

Beveridge v. Illinois Fuel Co. ——— Ill. ———, 119 N. E. 46.

The employer and employee automatically accept the provisions of the act without filing an election not to accept the act.

Favror v. Superior Coal Co., 188 Ill. App. 203, p. 207.

See Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480;

Bateman v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357;

Price v. Clover Leaf Coal Min. Co., 188 Ill. App. 27, p. 31.

7. REJECTION BY EMPLOYER—EFFECT AND LIABILITY—PROOF.

Where an employer has elected not to be bound by the act, then the parties are remitted to their action at law and are governed by the rules and principles

applicable to such actions, except as to the matter of defense of assumed risk, fellow servant and contributory negligence.

Crooks v. Tazewell, 263 Ill. 343, p. 348.

See *Dietz v. Big Muddy Coal & Iron Co.*, 263 Ill. 480.

A notice by a coal mine operator of his rejection of the provisions of the act and on file at the place provided by law remains good until withdrawn and fixes the status of the parties and proof of such fact is sufficient to show that a coal mine operator was not operating his coal mine under the workmen's compensation act at the time of the injuries sued for by the miner.

Bateman v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357, p. 367.

See *Price v. Clover Leaf Coal Min. Co.*, 188 Ill. App. 27, p. 31.

A certified copy of the notice filed by a coal mine operator not to come within the provisions of this act is admissible in evidence to prove that he had rejected the provisions of the act; but the original notice without proof of its being filed as required is not admissible.

Bateman v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357, p. 367.

8. REJECTION BY EMPLOYEE—NOTICE.

Where an employer refuses to accept the provisions of the act an employee has no option in the matter; but it is only when the employer accepts its provisions that the employee may reject it and must give notice thereof. The employee only has the right of election where the employer has elected to accept this provision.

Favor v. Superior Coal Co., 188 Ill. App. 203, p. 207.

See *Dietz v. Big Muddy Coal & Iron Co.*, 263 Ill. 480.

Bateman v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357.

Price v. Clover Leaf Coal Min. Co., 188 Ill. App. 27, p. 31.

9. DEFENSES AVAILABLE TO EMPLOYER.

A mine operator who has rejected the provisions of the workmen's compensation act cannot in an action by a miner for damages for injuries, set up the defenses of assumed risk, fellow servant or contributory negligence, except that contributory negligence may be shown for the purpose of lessening the damages.

Crooks v. Tazewell, 263 Ill. 343, p. 349;

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 484.

The legislature has clearly taken away the common law action as to all miners or employees who have elected to be governed by the statute. The existence or non-existence of the common law defense depends upon the status of the employer in respect to the act and not the status of the employee.

Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 480, p. 484.

10. MINER'S RIGHT TO RECOVER FOR INJURY—PROOF.

In an action by a miner against an operator for damages for injuries caused by a dangerous condition in the mine in that particles and large lumps of coal were scraped off the cars and permitted to accumulate on the track, thereby causing the injuries complained of, the miner may show that the operator had not provided and had not paid the compensation provided by this act.

Crooks v. Tazewell, 263 Ill. 343, p. 349.

In an action by a miner against the operator for injuries it is proper for the complainant to show that the operator as employer had elected not to come under the provisions of this statute.

Crooks v. Tazewell, 263 Ill. 343, p. 348.

See *Dietz v. Big Muddy Coal & Iron Co.*, 263 Ill. 480.

11. CONTRIBUTORY NEGLIGENCE OF MINER—EFFECT ON RECOVERY.

A mine operator can not escape liability for the injuries sustained by the miner arising out of and in the course of his employment, if the liability is shown, although the injuries were proximately caused by the contributory negligence of the miner himself, but any such contributory negligence may be considered in reducing the amount of damages.

Crooks v. Tazewell, 263 Ill. 343, p. 349.

Where in an action against a coal-mine operator for damages for injuries to a miner the proof shows that the operator had elected not to come under the "Illinois workmen's compensation act" of 1911, he can not escape liability for injuries sustained by a miner on the ground that the miner assumed the risk, or because the injury or death of the miner was proximately caused by his own contributory negligence.

Bell v. Toluca Coal Co., 272 Ill. 576, p. 585.

12. PROCEDURE UNDER ACT—ARBITRATION.

The workmen's compensation act of Illinois (Laws 1913, p. 347) provides (sec. 16) that the industrial board may make rules and orders for carrying out the duties imposed upon it, and that the process and procedure shall be as simple and summary as reasonably may be. It provides also (sec. 19) for the appointment of a committee of arbitration, where the employer and employee can agree. There is no time fixed within which the committee shall make its investigation and report, and the statute in no way intimates that the committee of arbitration can be relieved from making a report because the members do not agree, but it positively provides that it shall report. When a committee was duly appointed and reported that it could not agree, it was the duty of the board to refer the matter back and require a final report from the committee.

Kerens-Donnewald Coal Co. v. Industrial Board, etc., 277 Ill. 35, p. 37.

13. NOTICE OF INJURY—SUFFICIENCY.

Under the Illinois workmen's compensation act, a verbal notice of the injury to the employer is sufficient.

Smith, Sohr Coal Mining Co. v. Industrial Board, etc., 279 Ill. 88, p. 92.

Section 24 of the Illinois workmen's compensation act requires that notice of an accident be given the employer as soon as practical, but not later than thirty days after the accident, and the notice shall apprise the employer fully of the circumstances and injury. The purpose of this was to prevent employers from being held liable for fraudulent injuries without an opportunity of investigating before such a lapse of time that the fraud could not be discovered.

Casparis Stone Co. v. Industrial Board, etc., 278 Ill. 77, p. 82.

14. DISABILITY—PERMANENT AND PARTIAL—INCREASED—REVIEW.

A finding of the industrial board under the Illinois workmen's compensation act of 1913, that the injured workman is "now totally disabled," is not a finding and does not have the effect of a finding that the injured workman is permanently disabled. A man might now be totally disabled and yet not permanently disabled.

Illinois Midland Coal Co. v. Industrial Board, etc., 277 Ill. 333, p. 336.

It was not the intention of the Illinois workmen's compensation act to defeat a recovery because of any inaccuracy or technical defect in the form

of the notice where a disability for which the employee has received compensation has occurred or increased. The employee may without previous notice, but within eighteen months from the time of the agreement or award, petition for a review under the original section 19h (sec. 144). On such review the petitioner must produce in evidence the record of the former hearing, as this is essential to the review, and it is error to receive evidence as if the hearing were an original one. On such review or rehearing, the injured employee can only be permitted to show the changes in his condition since the former hearing.

Casparis Stone Co. v. Industrial Board, etc., 278 Ill. 77, p. 83.

By the failure to file a statement of the facts as shown by the additional testimony on the review of a claim, or a stenographic report of the same, a material step in the proceedings to review the decision of the Illinois Industrial board was admitted, but under such circumstances it must be presumed that the additional evidence heard was sufficient to sustain the board's findings in the absence of such additional testimony from the record. So in the absence of a report of such additional testimony the finding of the board that sufficient notice had been given is conclusive and it must be assumed that the additional evidence offered supported the finding of the board on the question of temporary and total disability.

Smith, Sohr Coal Mining Co. v. Industrial Board, etc., 279 Ill. 88, p. 92.

Section 8 of the Illinois workmen's compensation act provides, among other things, that where if an injury has been sustained the employee as a result thereof becomes partly incapacitated from pursuing his usual employment he shall be entitled to compensation at the specified rate. The previous physical condition of the employee is unimportant so long as the injury sustained is the proximate cause of the incapacity for which compensation is sought. The protection afforded is not confined to healthy employees. It is the injury arising out of the employment and not out of the disease of the employee for which compensation is made. It is the hazards of the employment acting upon the particular employee, not his condition of health, and not what the hazards would be in acting upon a healthy employee. An employee may be suffering from some ailment and the exertion of the employment or the injury may develop his condition in such a manner that it becomes a personal injury and he is entitled to recover for all the consequences attributable to the injury. The augmenting or aggravating of a preexisting ailment may therefore be a personal injury within the workmen's compensation act.

Big Muddy Coal & Iron Co. v. Industrial Board, etc., 279 Ill. 235, p. 238.

15. INDUSTRIAL BOARD—JURISDICTION—CONCLUSIVENESS OF FINDING—APPEAL.

Under section 19 of the workmen's compensation act of 1913, when the industrial board acts within its power, its findings upon the facts are conclusive upon the courts.

Illinois Midland Coal Co. v. Industrial Board, etc., 277 Ill. 333, p. 336.

On appeal from a decision of the industrial board provided for by the workmen's compensation act of Illinois (Laws 1913, p. 347) the court, in reviewing the proceedings of the board, can only review questions of law and can only determine from the facts recited in the decision of the industrial board whether that body acted within its powers in making the award.

Kerens-Donnewald Coal Co. v. Industrial Board, etc., 277 Ill. 35, p. 38.

See *McMurray v. Peabody Coal Co.*, ——— Ill. ———, 118 N. E., 29.

The jurisdiction of the industrial board to review the proceedings of the committee of arbitration does not depend on the filing of a stenographic report within the time specified by the statute. It is sufficient if at any time before the hearing a properly authenticated stenographic report is filed with the industrial board. The date fixed by the statute as to the filing of the stenographic report is directory and not mandatory, and is not jurisdictional.

Illinois Midland Coal Co. v. Industrial Board, 277 Ill. 333, p. 335.

16. APPLICATION OF STATUTE.

The statute does not apply to a driver employed by a retail coal dealer injured while driving a team hauling material other than coal. The injured employee was not engaged in any extrahazardous occupation within the meaning of the statute.

Fruit v. Industrial Board, etc., ——— Ill. ———, 119 N. E. 931, p. 932.

See Sugar Valley Coal Co. v. Drake, ——— Ind. App. ———, 117 N. E. 937, p. 938.

SESSION LAWS 1917.

DEPARTMENT OF MINES AND MINERALS.

CREATION OF DEPARTMENT OF MINES AND MINERALS.

LAWS 1917, P. 4.

MARCH 7, 1917.

AN ACT In relation to the civil administration of the State government, and to repeal certain acts therein named.

SEC. 1. Be it enacted, etc.:

This Act shall be known as "The Civil Administrative Code of Illinois."

SEC. 2. The word "department," as used in this Act, shall, unless the context otherwise clearly indicates, means the several departments of the State government as designated in section 3 of this Act, and none other.

SEC. 3. Departments of the State government are created as follows: * * *

The Department of Mines and Minerals; * * *

SEC. 4. Each department shall have an officer at its head who shall be known as a director, and who shall, subject to the provisions of this Act, execute the powers and discharge the duties vested by law in his respective department.

The following officers are hereby created: * * *

Director of Mines and Minerals, for the Department of Mines and Minerals. * * *

SEC. 5. In addition to the directors of departments, the following executive and administrative officers, boards and commissions, which said officers, boards and commissions in the respective departments, shall hold offices hereby created and designated as follows: * * *

In the Department of Mines and Minerals:

Assistant Director of Mines and Minerals;

The Mining Board, which shall consist of four officers designated as Mine Officers and the Director of the Department of Mines and Minerals;

The Miners' Examining Board, which shall consist of four officers, designated Miners' Examining Officers.

* * * * *

SEC. 7. * * *

The Director of Mines and Minerals shall be a person thoroughly conversant with the theory and practice of coal mining, but who is not identified with either coal operators or coal miners. Of the four mine officers, two shall be coal operators and two shall be practical coal miners.

Each of the three miners' examining officers shall have had at least five years' practical and continuous experience as a coal miner and have been actually engaged as a coal miner in this State continuously for twelve months next preceding his appointment, and no one of whom shall hold any lucrative public office, Federal, State, or municipal. * * *

SEC. 8. Each advisory and nonexecutive board, except as otherwise expressly provided in this Act, with respect to its field of work, or that of the department with which it is associated, have the following powers and duties;

1. To consider and study the entire field; to advise the executive officers of the department upon their request; to recommend, on its own initiative, policies

and practices, which recommendations the executive officers of the department shall duly consider, and to give advice or make recommendations to the Governor and the General Assembly when so requested, or on its own initiative;

2. To investigate the conduct of the work of the department with which it may be associated, and for this purpose to have access, at any time, to all books, papers, documents, and records pertaining or belonging thereto, and to require written or oral information from any officer or employee thereof;

3. To adopt rules, not inconsistent with law, for its internal control and management, a copy of which rules shall be filed with the director of the department with which such board is associated;

4. To hold meetings at such times and places as may be prescribed by the rules, not less frequently, however, than quarterly;

5. To act by a subcommittee, or by a majority of the board, if the rules so prescribe;

6. To keep minutes of the transactions of each session, regular or special, which shall be public records and filed with the director of the department;

7. To give notice to the governor and to the director of the department with which it is associated of the time and place of every meeting, regular or special, and to permit the governor and the director of the department to be present and to be heard upon any matter coming before such board.

SEC. 9. The executive and administrative officers whose offices are created by this Act shall receive annual salaries, payable in equal monthly installments, as follows: * * *

In the Department of Mines and Minerals:

The Director of Mines and Minerals shall receive five thousand dollars.

The Assistant Director of Mines and Minerals shall receive three thousand dollars.

Each mine officer shall receive five hundred dollars.

Each miners' examining officer shall receive one thousand eight hundred dollars. * * *

SEC. 35. The following offices, boards, commissions, arms, and agencies of the State government heretofore created by law, are hereby abolished, viz: * * * State mining board, chief clerk of the State mining board, State mine inspectors, miners' examining commissioners, constituting the miners' examining board, mine fire fighting and rescue station commission, superintendents of mine fire fighting and rescue stations. * * *

DEPARTMENT OF MINES AND MINERALS—POWERS.

SEC. 45. The Department of Mines and Minerals shall have power:

1. To exercise the rights, powers and duties vested by law in the State mining board, its officers and employees;

2. To exercise the rights, powers, and duties vested by law in the State mine inspectors;

3. To exercise the rights, powers, and duties vested by law in the miners' examining commission, its officers and employees;

4. To exercise the rights, powers, and duties vested by law in the mine fire-fighting and rescue station commission, superintendents and assistant superintendents, other officers and employees of the several mine-rescue stations;

5. To acquire and diffuse information concerning the nature, causes, and prevention of mine accidents;

6. To acquire and diffuse information concerning the improvement of methods, conditions and equipment of mines, with special reference to health, safety, and conservation of mineral resources;

7. To make inquiries into the economic conditions affecting the mining, quarrying, metallurgical, clay, oil, and other mineral industries;

8. To promote the technical efficiency of all persons working in and about the mines of the State, and to assist them better to overcome the increasing difficulties of mining, and for that purpose to provide bulletins, traveling libraries, lectures, correspondence work, classes for systematic instruction, or meetings for the reading and discussion of papers, and to that end to cooperate with the University of Illinois.

Sec. 46. The mining board, in the Department of Mines and Minerals, shall:

1. Hold such meetings, from time to time, as may be necessary for the proper discharge of its duties;

2. Conduct the examination and pass upon the practical and technological qualifications and personal fitness of all persons employed in the department of mines and minerals as inspectors of mines;

3. Conduct examinations and pass upon the practical and technological qualifications and personal fitness of persons seeking certificates of competency as mine managers, mine examiners, and hoisting engineers;

4. Conduct examinations, at the capitol, on the second Tuesday in September of each year, and at such other times as may be necessary, of candidates for employment as inspectors of mines;

5. Conduct examinations of persons seeking certificates of competency as mine managers, mine examiners, and hoisting engineers at such times and places within the State as shall, in the judgment of the board, afford the best facilities to the greatest number of candidates;

6. Give public notice, through the public press or otherwise, not less than ten days in advance, announcing the time and place at which any examination is to be held;

7. Prescribe uniform rules, conditions, and regulations for the examination of persons seeking employment as inspectors of mines and of those seeking certificates of competency as mine managers, mine examiners and hoisting engineers;

8. Report in writing to the Director of Mines and Minerals the names of persons qualified to be employed by the department of mines and minerals as inspectors of mines, and of those authorized to receive certificates of competency as mine managers, mine examiners and hoisting engineers;

9. Supervise, control and direct the State mine inspection service;

10. Have power to remove any inspector of mines or to cancel the certificate of any mine manager, mine examiner, or hoisting engineer, as provided in paragraphs (h) and (i) of section 3 of an Act entitled, "An Act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, and all amendments thereto, past or future, or modifications thereof;

11. Preserve and keep on file, for not less than one year, all written examination papers and all other papers of any applicant, and to permit the inspection thereof by any applicant interested, at all reasonable times, and to give to any applicant a certified copy of any or all of his papers.

Sec. 47. The Director of Mines and Minerals shall be the executive officer of the mining board and shall execute orders, rules, and regulations made and promulgated by the mining board, and shall issue, in the name of the department of mines and minerals, certificates of qualification and competency to persons certified to him by the mining board and to no other persons.

SEC. 48. The Department of Mines and Minerals shall exercise and discharge the rights, powers and duties vested by law in the miners' examining commissioners, constituting the miners' examining board for the State of Illinois, under an act entitled, "An Act to provide for the safety to persons employed in and about coal mines, and to provide for the examination of persons seeking employment therein, in order that only competent persons may be employed as miners, and to create a board of examiners for this purpose and to provide a penalty for the violation of the same, and to repeal an Act entitled, 'An Act to amend an Act entitled, "An Act to provide for the safety of persons employed in and about coal mines and to provide for the examination of persons seeking employment as coal miners, and providing penalties for the violation of the same," approved June 1, 1908, in force July 1, 1908,' approved June 5, 1909, in force July 1, 1909," approved June 27, 1913, in force July 1, 1913, and all amendments thereto, past or future, or modifications thereof. (See page 92.)

Said act and all amendments thereto and modifications thereof, if any, shall be administered by the miners' examining board created by this Act, and in its name, without any direction, supervision, or control by the Director of Mines and Minerals, or by the mining board.

SEC. 64. The following Acts and parts of Acts are hereby repealed. * * *

"An Act to prevent accidents in mines and other industrial plants, and to conserve the resources of the State by the establishment of Illinois miners' and mechanics' institutes, and for the administration and support of the same," approved May 23, 1911, in force July 1, 1911. * * * (See page 104.)

"An Act to establish and create at the University of Illinois, the bureau to be known as a state geological survey, defining its duties and providing for the preparation and publication of its reports and maps to illustrate the natural resources of the State, and making appropriations therefor," approved May 12, 1905, in force July 1, 1905. * * * (See page 24.)

APPROPRIATIONS.

LAWS 1917, 153, P. 174.

JUNE 29, 1917.

AN ACT to provide for the ordinary and contingent expenses of the State Government, etc.

SEC. 1. Be it enacted, etc.:

That the following-named sums * * * be, and are hereby, appropriated to meet the ordinary and contingent expenses of the State Government, until the expiration of the first fiscal quarter after the adjournment of the next General Assembly. * * *

DEPARTMENT OF MINES AND MINERALS.

Sixty-seventh—To the Director of Mines and Minerals for expenses and equipment of the Department of Mines and Minerals: For salaries and wages: For 12 mine inspectors at \$1,800 each per annum, \$21,600 per annum; for statistician, \$1,800 per annum; for clerk, \$1,500 per annum; for 2 stenographers at \$1,200 each per annum, \$2,400 per annum; for messenger, \$900 per annum; for secretary to the director, \$2,000 per annum; for teams of 5 men at the 6 mine rescue stations, \$3,600 per annum; for 6 superintendents at mine rescue stations at \$1,500 each per annum, \$9,000 per annum; for wages of mine rescue teams at fires and explosions, \$1,000 per annum; for extra helmet men at fires and explosions and emergency substitutes at mine rescue stations, \$2,000 per annum; for investigator to inquire into economic conditions affecting mining and all other mineral industries, \$2,000 per annum; for departmental office expenses, \$4,615

per annum; for traveling expense, \$24,000 per annum; for operating supplies and expenses, \$4,450 per annum; for repairs to present grounds, buildings, and equipment, \$1,500 per annum; for equipment, \$5,083 for the biennium; for reserve and contingencies, \$4,000 per annum.

(Total for Department of Mines and Minerals, \$177,813.00.)

MINE FIRE-FIGHTING EQUIPMENT.

EQUIPMENT FOR MINE FIRE FIGHTING.

LAWS 1917, P. 596.

JUNE 27, 1917.

AN ACT to amend an Act entitled, 'An Act to require fire-fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines,' approved and in force March 8, 1910, as subsequently amended, by amending sections two (2) and six (6) thereof. (See page 33.)

SEC. 1. Be it enacted, etc.:

That an Act entitled, "An Act to require fire-fighting equipment and other means for the prevention and controlling of fires and the prevention of loss of life from fires in coal mines," approved and in force March 8, 1910, as subsequently amended, be and the same is hereby amended, by amending sections two (2) and six (6) thereof to read as follows:

SEC. 2. (a) There shall be provided a supply of water for fighting fire underground which shall have a head from a standing body in a pipe tank or pond.

(b) Such water supply shall be conducted into the mine in an iron or steel pipe or pipes not less than two inches in diameter, which shall have not less than two hose connections at the bottom of the hoisting shaft, and two hose connections at the bottom of the air and escapement shaft designated as such under the law, and two hose connections in each stable which is located less than five hundred (500) feet from the bottom of either of said shafts; and there shall be iron or steel pipes not less than two inches in diameter in the entries and passageways leading from the bottom of each of said shafts to such extent and such position that with one (1) fifty-foot length of hose the water may be carried into all such entries and passageways within three hundred (300) feet from the bottom of each of said shafts and into the corresponding area in slope and drift mines, such area to be designated in this Act as the fire-protected area.

(c) Provided, that in mines having one hundred and twenty-five (125) feet or less head at the bottom of the incoming supply pipe, the incoming pipes and the pipes having hose connections shall be not less than three (3) inches in diameter. The pipes in the mine shall have hose connections not more than fifty (50) feet apart beginning at the bottom of the incoming supply pipe or pipes.

(d) There shall be kept constantly on hand at the bottom of each shaft where hose connections are required, in condition for immediate use, not less than two (2) fifty (50) foot lengths of one and one-half (1½) inch inside diameter linen hose or rubber-lined cotton hose, which shall have been tested to a pressure of two hundred (200) pounds to the square inch; all of such hose and connections therefor on the supply pipes shall have American standard iron-pipe threads. The nozzles on such hose shall be not less than three-eighths (¾) nor more than five-eighths (⅝) inch in diameter.

(e) Where any part of any passage or other excavation within one hundred and fifty (150) feet of the bottom of the hoisting shaft or the air and escapement shaft, designated as such under the law and in the corresponding area in slope or drift mines, is timbered, with cribbing or more than one layer of lagging, not including caps or wedges, above the cross bars, there shall be two lines of automatic sprinklers on the under side of such timbering, attached to not less

than one and one-half (1½) inch pipes connected with the fire-fighting water supply, and such sprinklers shall not be more than ten (10) feet apart.

(f) In cribbing or lagging as last aforesaid, which is more than three (3) feet in vertical thickness, there shall be also, as near the top thereof as is practicable, automatic sprinklers connected with the water supply as last aforesaid, and there shall be one such sprinkler for each eight (8) feet square or horizontal area of such cribbing or lagging.

(g) In every underground stable, located within one thousand (1,000) feet of the hoisting shaft or the air and escapement shaft designated as such under the law, there shall not be less than one (1) automatic water sprinkler for each area eight (8) feet square in said stable; such automatic sprinklers shall be connected with iron or steel pipes not less than one and one-half (1½) inches in diameter along the roof or ceiling in the stable, which shall be connected with the fire-fighting water supply.

(h) All automatic sprinklers shall be of the fusible plug type and shall not require a temperature of more than one hundred and sixty-five (165) degrees Fahrenheit to release the water.

(i) In all underground stables other than those heretofore in this Act referred to, there shall be kept barrels full of water and two metal pails with each barrel. Such barrels shall be not more than fifty (50) feet apart, and there shall not be less than two (2) barrels full of water and two (2) metal pails with each barrel in each entry or passageway into which such stable opens and not more than fifty (50) feet from the opening of the stable.

(j) There shall also be one (1) not less than two and one-half (2½) gallons chemical fire extinguishers, or its equivalent, as approved by the Department of Mines and Minerals, and two (2) not less than six (6) gallon hand-pump buckets in each stable and in each entry or passageway into which such stable opens not more than fifty (50) feet from the opening of such stable: Provided, that in mines employing ten (10) men or less underground the chemical fire extinguishers shall not be required. Such chemical fire extinguishers and hand-pump buckets shall be kept filled and ready for use.

(k) Provided, however, that in coal mines in which less than ten (10) men are employed, in which there are no stables, in lieu of said water supply with pipes and hose, there may be substituted the following: There shall be kept within the fire protected area in each such mine barrels full of water not more than fifty (50) feet apart, and with each barrel there shall be two metal buckets; and there shall also be kept within said area not less than six (6) hand-pump buckets of not less than six (6) gallons capacity, and said buckets shall be kept filled and ready for use.

(l) A barrel within the meaning of this Act shall be any substantial vessel holding not less than fifty (50) gallons.

(m) All mines shall have at least one, not less than two and one-half (2½) gallon chemical fire extinguisher, or its equivalent, as approved by the Department of Mines and Minerals, and one not less than six (6) gallon hand-pump bucket, including those hereinbefore in this Act required, for each fifty (50) employees in the mine, with a minimum of six (6) extinguishers and six (6) pump buckets, kept at convenient places designated by the mine manager throughout the mine, and three (3) fire extinguishers of two and one-half (2½) gallons each, or its equivalent as approved by the Department of Mines and Minerals, in each building located within one hundred (100) feet of any shaft, drift or slope, and such extinguishers shall be recharged once every six months and a record made of the date of recharging in the mine examiner's report book: Provided, this does not apply to buildings constructed of fireproof material. Such extinguishers and buckets shall be kept filled and ready for use: Provided,

that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

SEC. 6. The following requirements also shall apply to all coal mines developed within the State of Illinois after the passage of this Act: "Provided, that paragraphs (a) and (b) shall not apply to mines where ten (10) men or less are employed."

(a) The hoisting shaft and the air and escapement shaft designated as such under the law in shaft mines and the air and escapement shaft nearest the main opening in slope or draft (drift) mines shall be of fireproof construction, except that cage guides may be wood. All drifts and slopes that are opened after the passage of this Act must be of fireproof construction for a distance of three hundred (300) feet from the entrance: Provided, that this section shall not apply to shafts in actual course of construction at the time this Act takes effect.

(b) The roof and walls of the passageways leading from the bottom of the hoisting shaft and the air and escapement shaft designated as such under the law, within a distance of three hundred (300) feet from the bottom of either of said shafts, shall be of fireproof construction, except that the coal rib or pillar may be used as a wall in such passageways.

(c) All underground stables and the openings therein shall be of fireproof construction.

Stables in mines opened after the passage of this Act shall not be located between the main and escapement shaft, or in direct line on the ventilating current or on passageways leading to the escapement shaft or shafts.

(d) At mines constructed in conformity with the requirements of this section of this Act, the fire-fighting equipment described in section 2, and the fire drill described in section 5 of this Act shall not be required, except that there shall be kept at convenient places designated by the mine manager, throughout each mine, one not less than two and one-half (2½) gallons chemical fire extinguisher, or its equivalent as approved by the Department of Mines and Minerals, and one not less than six (6) gallon hand-pump bucket for each fifty (50) employees in the mine with a minimum of six (6) extinguishers and six (6) pump buckets, and such extinguishers and buckets shall be kept filled and ready for use: Provided, that in mines employing ten (10) men or less underground, the chemical fire extinguishers shall not be required.

MINING INVESTIGATING COMMISSION.

INVESTIGATING COMMISSION. (SEE PAGE 124.)

LAWS 1917, P. 599.

JUNE 27, 1917.

"AN ACT To establish a Mining Investigation Commission of the State of Illinois," and to make appropriation therefor.

SEC. 1. Be It enacted, etc.:

That a commission be established to be known as the Mining Investigation Commission of the State of Illinois, consisting of three coal-mine owners and three coal miners appointed by the Governor, together with three qualified men, no one of whom shall be identified or affiliated with the interests of either of the mine owners or coal miners or dependent upon the patronage or good will of either, nor in political life who shall be appointed by the Governor.

Each member of the said commission shall have equal authority, power, and voting strength in considering and acting upon any matters which may be brought to the attention of the commission and on which the commission may act and the said commission shall have power and authority to investigate the

methods and conditions of mining coal in the State of Illinois, with special reference to the safety of human lives and property and the conservation of coal deposits.

SEC. 2. In making an investigation as contemplated in this Act, said commissioners shall have the power to issue subpoenas for the attendance of witnesses, which shall be under the seal of the commission and signed by the chairman or secretary of said commission.

In case any person shall wilfully fail or refuse to obey such subpoena, it shall be the duty of the Circuit Court of any county, upon application of the said commissioners, to issue an attachment for such witness, and compel such witness to attend before the commissioners, and give his testimony upon such matters as shall be lawfully required by such commissioners; and the said court shall have the power to punish for contempt, as in other cases of refusal to obey the process and order of such court.

The fees of witnesses shall be the same as in the courts of record and shall be paid out of the appropriation hereinafter made.

And upon order duly entered of record by the said commission any one or more members of the said commission shall be empowered to take testimony touching the matters within the jurisdiction of the said commission and report the same to the said commission.

Said commission shall have power and are authorized to adopt a seal and to make such rules not inconsistent with or contrary to law for the government of proceedings before it, as it may deem proper and shall have the same power to enforce such rules and to preserve order and decorum in its presence as is vested by the common law or statute of this State in any court of general jurisdiction.

SEC. 3. Said commission shall meet at the State capitol building in Springfield on the second Tuesday after notice of their appointment and shall immediately elect a chairman and secretary from among their number, one of whom shall be a coal mine owner and the other a coal miner. Said commission shall cause a record to be kept of all its proceedings.

Five members of the said commission shall constitute a quorum for the transaction of business, but a less number than a quorum may adjourn the meeting of the commission from time to time.

Meetings of the said commission other than called meetings, as provided for herein, may be held at such times and places within the State of Illinois, as may be fixed by the said commission.

A meeting of the said commission shall be held upon the written request of any three members of the said commission signed by them and delivered to the secretary, who shall, upon receipt of such request, notify each member of said commission by mail of such meeting so to be held, and the time and place thereof. And no such meeting shall be held less than five days after the mailing of notice of the said meeting to the members of said commission by the secretary.

Such called meeting shall be held either in Springfield or Chicago.

SEC. 4. Said commission shall report to the Governor and to the General Assembly at its next regular session, submitting—so far as they have unanimously agreed, a proposed provision (revision) of coal mining laws of the State, together with such other recommendations as to the commission shall seem fit and proper relating to coal mining in the State of Illinois.

And where there is not unanimous agreement upon any recommendation there shall be submitted in like manner separate reports embodying the recommendations of any one or more members of the said commission, which said reports shall each set forth in detail the recommendation of the commissioner or commissioners signing said report and shall embody his or their respective reasons for such recommendation and his or their objection to the report of other mem-

bers of the commission. The duties and functions of said commission shall cease and the terms of office of the respective commissions (commissioners) shall terminate upon the adjournment of the Fifty-first General Assembly.

SEC. 5. The members of said commission who are coal-mine owners and coal miners, as aforesaid, shall receive no compensation for their services. The remaining three members of the commission shall receive as compensation for their services the sum of \$10.00 per day for each day actually employed by them as such commissioners. All members of the said commission shall be reimbursed for their actual expenses incurred in and about the actual work of said commission.

Said commission may appoint a stenographer or clerk and such other employees as are necessary and shall fix their compensation and may incur such other expenses as are properly incidental to the work of the commission.

SEC. 6. The sum of seven thousand dollars (\$7,000.00), or as much thereof as may be necessary, is hereby appropriated for the postage, stationery, clerical and expert services, and incidental traveling expenses of the commission, and the per diem of members as herein authorized, and the Auditor of Public Accounts is hereby authorized to draw his warrant for the foregoing amount, or any part thereof, in payment of any expenses, charges, or disbursements authorized by this Act, on order of this commission, signed by its chairman, attested by its secretary, and approved by the Governor.

The Department of Public Works and Buildings is hereby authorized and directed to provide all necessary printing for the Mining Investigating Commission, and testimony taken by it shall be reported in full and may be published from time to time by the commission.

MINING OPERATIONS.

VENTILATION. (SEE PAGE 219.)

LAW 1917, P. 602.

JUNE 27, 1917.

AN ACT To amend an Act entitled 'An Act to revise the law in relation to coal mines and subjects relating thereto and providing for the health and safety of persons employed therein,' approved June 6, 1911, in force July 1, 1911, as subsequently amended by amending section fourteen (14) thereof.

SEC. 1. Be it enacted, etc.: That an Act entitled "An Act to revise the law in relation to coal mines and subjects relating thereto and providing for the health and safety of persons employed therein," approved June 6, 1911, in force July 1, 1911, as subsequently amended, be and the same is hereby amended by amending section fourteen (14) thereof to read as follows:

SEC. 14. VENTILATION. (a) At every coal mine there shall be provided, supplied, and maintained an amount of air which shall not be less than one hundred (100) cubic feet per minute for each person, and not less than five hundred (500) cubic feet per minute for each animal in the mine, measured at the foot of the downcast and of the upcast, except that in gaseous mine(s) there shall be not less than one hundred and fifty (150) cubic feet of air per minute for each person in the mine. The Inspector shall have power by order in writing to require these quantities to be increased.

(b) The main current of air shall be so split or subdivided as to give a separate current or (of) reasonably pure air to every 100 men at work, and the Inspector shall have authority to order, in writing, separate currents for smaller groups of men, if, in his judgment, special conditions render it necessary.

(c) Doors, curtains, or brattices shall be placed at such places as may be designated by the mine manager, subject to the approval of the State Inspector,

to conduct into the working places an amount of air sufficient to render the working places reasonably free from deleterious air of every kind.

(d) Away from the pillar for the mine bottom, crosscuts between entries shall be made not more than sixty feet apart without permission of the State Inspector of the district, and then only in case of "faults." When such consent is given, brattice or other means must be provided within sixty feet of the face to convey the air to the working place until a crosscut is opened up.

When undercut or sheared, the entry, crosscut, and room neck may be advanced concurrently, but not more than one cutting shall be shot in the room neck until the crosscut is finished; and after the entry has advanced fifteen feet beyond the location of the new crosscut, only one shot shall be fired in the entry to two in either or both the crosscut and room neck at the same shooting time.

When not undercut or sheared, the entry and crosscut may be advanced concurrently, but no room shall be opened in advance of the last open crosscut, and after the entry has advanced fifteen feet beyond the location of a new crosscut only one shot shall be fired in the entry to two in the crosscut at the same shooting time.

Not more than three shots shall be exploded at one shooting time ahead of the last open crosscut.

(e) After the taking effect of this Act, the first crosscut between all rooms off any entry shall not be more than sixty (60) feet from the rib of the entry. Additional crosscuts shall not be more than sixty (60) feet apart: Provided, however, that if in any mine the conditions are such that in the judgment of the duly accredited representative of the Department of Mines and Minerals, expressed in writing, it is considered equally safe and more advantageous to leave a blind pillar between not less than every three rooms, the Department of Mines and Minerals shall have power to grant the authority to leave said pillar subject to review by the Department of Mines and Minerals on formal complaint of the representative of either party in interest and after an open hearing.

(f) All crosscuts connecting inlet and outlet air courses, except the last one nearest the face, shall be closed with substantial stoppings to be made as nearly air-tight as possible. In the making of the air-tight partitions or stoppings, no loose material or refuse shall be used.

Crosscuts between rooms, except the one nearest the face, shall be closed sufficiently to carry to the working places the amount of air required by law.

(g) All possible care and diligence shall be exercised in the examination of working places, especially for the investigation and detection of explosive gases therein, and where found such gas shall be removed by a special current of air produced by bratticing or from a pipe before men are permitted to work in such places with other lights than safety lamps.

(h) If, in any mine, the conditions are such that, in the judgment of the mine manager or the judgment of the State Mine Inspector expressed in writing, it is necessary to use safety lamps only in working said mine, other lights shall not be used therein.

(i) The air from the outlet of the stable shall not pass into the intake air current used for ventilating the working parts of the mine.

(j) All doors in mines used in guiding and directing the ventilating currents shall be hung and adjusted so as to close automatically.

(k) At all doors through which three or more drivers are hauling coal on any one shift an attendant shall be employed on said shaft (shift) for the purpose of opening and closing said doors when trips of cars are passing to and from the workings: Provided, the mine inspector in case of specially dangerous conditions shall have power to require in writing that an attendant be placed at doors through which less than three drivers shall pass. Places for shelter

shall be provided at such doorways to protect the attendants from being injured by the cars while attending to their duties: Provided, that in any or all mines, where doors are constructed in such a manner as to open and close automatically, attendants and places for shelter shall not be required.

(l) If the inspector shall find men working without the amount of air required by law he shall at once notify the mine manager to increase the amount of air in accordance with the law. Upon the failure or refusal of the manager to act promptly, and in all cases where men are endangered by such lack of air, the inspector shall at once order the men affected out of the mine.

(m) In case the passageways, roadways, or entries of any mine are so dry that the air becomes charged with dust the operator of such mine must have such roadways regularly and thoroughly sprayed, sprinkled, or cleaned.

(n) At all mines employing over one hundred (100) men underground and in all mines generating fire damp, the ventilating fan shall be run both day and night; at all mines employing less than one hundred (100) men underground, the fan shall be run at its usual speed for six (6) hours before men go into the mine to work. A recording pressure gauge shall be maintained in connection with each fan at all times: Provided, nothing in this clause shall apply to mines employing ten men or less.

WORKMEN'S COMPENSATION ACT.

AMENDATORY ACT. (SEE PAGES 403, 418.)

LAW 1917, P. 490.

MAY 31, 1917.

AN ACT to amend section 2, section 3, section 5, section 7, section 8, section 13, section 14, section 16, section 19, and section 31 of an Act entitled, "An Act, etc." (same as in section 1).

SEC. 1. Be it enacted, etc.: That section 2, section 3, section 5, section 7, section 8, section 13, section 14, section 16, section 19, and section 31 of an Act entitled, "An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment within this State; providing for the enforcement and administering thereof and a penalty for its violation, and repealing an Act entitled, 'An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment,' approved June 10, 1911, in force May 1, 1912," approved June 28, 1913, and in force July 1, 1913, as amended by an Act approved June 28, 1915, and in force July 1, 1915, be amended and that said Act as amended be further amended by adding thereto one additional section to be known as section 3½, which said section (sections) as hereby amended and said additional section, shall read as follows:

SEC. 2. Every employer enumerated in section 3, paragraph (b) shall be conclusively presumed to have filed notice of his election, as provided in section 1, paragraph (a), and to have elected to provide and pay compensation according to the provisions of this Act, unless and until notice in writing of his election to the contrary is filed with the Industrial board. Such notice of non-election may be withdrawn, as provided in this Act.

SEC. 3. (a) In any action to recover damages against an employer engaging in any of the enterprises or businesses enumerated in paragraph (b) of this section, who shall elect not to provide and pay compensation to any employee, according to the provisions of this Act, it shall not be a defense; that:

First—The employee assumed the risks of the employment;

Second—The injury or death was caused in whole or in part by the negligence of a fellow servant; or

Third—The injury or death was proximately caused by the contributory negligence of the employee.

(b) The provisions of paragraph (a) of this section shall apply to any employer engaging in any of the following enterprises or businesses, namely:

1. The erection, maintaining, removing, remodeling, altering, or demolishing of any structure, except as provided in subsection 8 of this section.

2. Construction, excavating, or electrical work, except as provided in subsection 8 of this section.

3. Carriage by land or water and loading or unloading in connection therewith.

4. The operation of any warehouse or general or terminal storehouses.

5. Mining, surface mining, or quarrying.

6. Any enterprise in which explosive materials are manufactured, handled, or used in dangerous quantities.

7. In any enterprise wherein molten metal, or explosive or injurious gases or vapors, or inflammable vapors or fluids, or corrosive acids are manufactured, used, generated, stored, or conveyed in dangerous quantities;

8. In any enterprise in which statutory or municipal ordinance regulations are now or shall hereafter be imposed for the regulating, guarding, use or the placing of machinery or appliances, or the protection and safeguarding of the employees or the public therein; each of which occupations, enterprises, or businesses are hereby declared to be extra-hazardous; Provided, nothing contained herein shall be construed to apply to any work, employment, or operations done, had or conducted by farmers and others engaged in farming, tillage of the soil, or stock raising, or to those who rent, demise, or lease land for any of such purposes, or to anyone in their employ, or to any work done on a farm, or country place, no matter what kind of work or service is being done or rendered.

SEC. 3½. (a) If the plaintiff in any action mentioned in section 3 shall in his declaration or in his other pleading allege that the employer has filed notice of his election not to provide and pay compensation according to the provisions of the Workmen's Compensation Act and such allegations be not denied by a verified pleading, then such employer shall for the purposes of that action be conclusively presumed to have filed his notice of nonelection.

(b) A certificate of the fact of the filing by an employer of the notice of nonelection provided in section 2 and of the nonwithdrawal thereof shall be prima facie proof in any action mentioned in section 3 of the fact of the filing of such notice of nonelection and of the nonwithdrawal thereof. Such certificate may be under the seal of the industrial board and signed by any member or the secretary thereof, of which seal and signature as such officer the court shall take judicial notice. Said certificate may be in substantially the following form:

This is to certify that the attached is a correct copy of notice filed with the industrial board by _____ on the _____ day of _____, 19____, electing not to provide and pay compensation according to the provisions of the Workmen's Compensation Act of Illinois, and that the original of said notice is now on file in the office of the industrial board and has not been withdrawn since the date of the filing thereof.

In witness whereof, this certificate has been subscribed and the seal of the industrial board affixed this _____ day of _____, 19____.

_____, of Industrial Board.

SEC. 5. The term "employee" as used in this Act, shall be construed to mean:

First—Every person in the service of the State, county, city, town, township, incorporated village, or school district, body politic or municipal corporations

therein, under appointment, or contract of hire, express or implied, oral or written, except any official of the State, or of any county, city, town, township, incorporated village, school district, body politic or municipal corporation therein: Provided, that any such employee, his personal representative, beneficiaries or heirs, who is, are or shall be entitled to receive a pension or benefit for or on account of disability or death arising out of or in the course of his employment from a pension or benefit fund to which the State or any county, town, township, incorporated village, school district, body politic or municipal corporation therein is a contributor, in whole or in part, shall be entitled to receive only such part of such pension or benefit as is in excess of the amount of compensation recovered and received by such employee, his personal representative, beneficiaries or heirs under this Act. And provided, further, that one employed by a contractor who has contracted with the State or a county, city, town, township, incorporated village, school district, body politic or municipal corporation, therein, through its representatives, shall not be considered, as an employee of the State, county, city, town, township, incorporated village, school district, body politic or municipal corporation which made the contract.

Second—Every person in the service of another under any contract of hire, express or implied, oral or written, including aliens, and minors who are legally permitted to work under the laws of the State, who, for the purpose of this Act, shall be considered the same and have the same power to contract, receive payments and give quittances therefor, as adult employees, but not including any person who is not engaged in the usual course of the trade, business, profession or occupation of his employer: Provided, that employees shall not be included within the provisions of this Act when excluded by the laws of the United States relating to liability of employers to their employees for personal injuries where such laws are held to be exclusive.

SEC. 7. The amount of compensation which shall be paid for on injury to the employee resulting in death shall be:

(a) If the employee leaves any widow, child or children whom he was under legal obligation to support at the time of his injury, a sum equal to four times the average annual earnings of the employee, but not less in any event than one thousand six hundred fifty dollars and not more in any event than three thousand five hundred dollars. Any compensation payments other than necessary medical, surgical, or hospital fees or services shall be deducted in ascertaining the amount payable on death.

(b) If no amount is payable under paragraph (a) of this section and the employee leaves any parent who at the time of injury was totally dependent upon the earnings of the employee, then a sum equal to four times the average annual earnings of the employee, but not less in any event than one thousand six hundred fifty dollars and not more in any event than three thousand five hundred dollars.

(c) If no amount is payable under paragraph (a) or (b) of this section and the employee leaves any parent, grandparent, or grandchild who at the time of injury was dependent upon the earnings of the employee, then such proportion of a sum equal to four times the average annual earnings of the employee as such dependency bears to total dependency, but not less in any event than one thousand six hundred fifty dollars and not more in any event than three thousand five hundred dollars. Any compensation payments other than necessary medical, surgical, or hospital fees or services shall be deducted in ascertaining the amounts payable on death.

(d) If no amount is payable under paragraphs (a), (b) or (c) of this section and the employee leaves collateral heirs dependent at the time of the injury

to the employee upon his earnings, such a percentage of the sum provided in paragraph (a) of this section as the average annual contributions which the deceased made to the support of such collateral dependent heirs during the two years preceding the injury bears to his average annual earnings during such two years.

(e) If no amount is payable under paragraph (a) or (b) or (c) or (d) of this section, a sum not to exceed one hundred and fifty dollars for burial expenses.

(f) All compensation except for burial expenses, provided for in this section to be paid in case injury results in death, shall be paid in instalments equal to one-half the average earnings, at the same intervals at which the wages or earnings of the employee were paid; or if this shall not be feasible, then the instalments shall be paid weekly: Provided, such compensation may be paid in a lump sum upon petition as provided in section 9 of this Act.

(g) The compensation to be paid for injury which results in death, as provided in this section, shall be paid at the option of the employer either to the personal representative of the deceased employee or to his beneficiaries, and shall be distributed to the heirs who formed the basis for determining the amount of compensation to be paid by the employer, the distributees' share to be in proportion of their respective dependency at the time of the injury on the earnings of the deceased: Provided, that, in the judgment of the court appointing the personal representative, a child's distributive share may be paid to the parent for the support of the child. The payment of compensation by the employer to the personal representative of the deceased employee shall relieve him of all obligations as to the distribution of such compensation so paid. The distribution by the personal representative of the compensation paid to him by the employer shall be made pursuant to the order of the court appointing him.

(h) 1. Whenever in paragraph (a) of this section a minimum of one thousand six hundred fifty dollars is provided, such minimum shall be increased in the following cases to the following amounts:

One thousand seven hundred fifty dollars in case of a widow and one child under the age of 16 years at the time of the death of the employee.

One thousand eight hundred fifty dollars in case of a widow and two or more children under the age of 16 years at the time of the death of the employee.

2. Wherever in paragraph (a) of this section a maximum of three thousand five hundred dollars is provided, such maximum shall be increased in the following cases to the following amounts:

Three thousand seven hundred fifty dollars in case of a widow and one child under the age of 16 years at the time of the death of the employee.

Four thousand dollars in case of a widow and two or more children under the age of 16 years at the time of the death of the employee.

SEC. 8. The amount of compensation which shall be paid to the employee for an injury not resulting in death shall be:

(a) The employer shall provide necessary first aid, medical, surgical, and hospital services; also medical, surgical, and hospital services for a period not longer than eight weeks, not to exceed, however, the amount of \$200.00. The employee may elect to secure his own physician, surgeon, or hospital services at his own expense.

(b) If the period of temporary total incapacity for work lasts for more than six working days, compensation equal to fifty per centum of the earnings, but not less than \$6.00 nor more than \$12.00 per week, beginning on the eighth day of such temporary total incapacity, and continuing as long as the temporary total incapacity lasts, but not after the amount of compensation paid equals the

amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving as provided in said paragraph (a), section 7.

(c) For any serious and permanent disfigurement to the hand, head, or face the employee shall be entitled to compensation for such disfigurement, the amount fixed by agreement or by arbitration in accordance with the provisions of this Act, which amount shall not exceed one-quarter of the amount of the compensation which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7: Provided, that no compensation shall be payable under this paragraph where compensation is payable under paragraph (d), (e) or (f) of this section: And provided, further, that when the disfigurement is to the hand, head, or face as a result of any injury, for which injury compensation is not payable under paragraph (d), (e) or (f) of this section, compensation for such disfigurement may be had under this paragraph.

(d) If, after the injury has been sustained, the employee as a result thereof becomes partially incapacitated from pursuing his usual and customary line of employment, he shall, except in the cases covered by the specific schedule set forth in paragraph (e) of this section, receive compensation, subject to the limitations as to time and maximum amounts fixed in paragraphs (b) and (h) of this section, equal to fifty per centum of the difference between the average amount which he earned before the accident, and the average amount which he is earning or is able to earn in some suitable employment or business after the accident. In the event the employee returns to the employment of the employer in whose service he was injured, the employee shall not be barred from asserting a claim for compensation under this Act: Provided, notice of such claim is filed with the industrial board within eighteen months after he returns to such employment, and the said board shall immediately send to the employer, by registered mail, a copy of such notice.

(e) For injuries in the following schedule the employee shall receive, in addition to compensation during the period of temporary total incapacity for work resulting from such injury, in accordance with the provisions of paragraphs (a) and (b) of this section, compensation for a further period, subject to the limitations as to time and amounts fixed in paragraphs (b) and (h) of this section, for the specific loss herein mentioned, as follows, but shall not receive any compensation for such injuries under any other provision of this Act:

1. For the loss of a thumb, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during sixty weeks;

2. For the loss of a first finger, commonly called the index finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during thirty-five weeks;

3. For the loss of a second finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during thirty weeks;

4. For the loss of a third finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during twenty weeks;

5. For the loss of a fourth finger, commonly called the little finger, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during fifteen weeks;

6. The loss of the first phalange of the thumb, or of any finger, shall be considered to be equal to the loss of one-half of such thumb, or finger, and compensation shall be one-half the amounts above specified;

7. The loss of more than one phalange shall be considered as the loss of the entire finger or thumb: Provided, however, that in no case shall the amount

received for more than one finger exceed the amount provided in this schedule for the loss of a hand;

8. For the loss of a great toe, fifty per centum of the average weekly wage during thirty weeks;

9. For the loss of one toe other than the great toe, fifty per centum of the average weekly wage during ten weeks, and for the additional loss of one or more toes other than the great toe, fifty per centum of the average weekly wage during an additional ten weeks;

10. The loss of the first phalange of any toe shall be considered to be equal to the loss of one-half of such toe, and compensation shall be one-half of the amount above specified;

11. The loss of more than one phalange shall be considered as the loss of the entire toe;

12. For the loss of a hand, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and fifty weeks;

13. For the loss of an arm, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during two hundred weeks;

14. For the loss of a foot, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and twenty-five weeks;

15. For the loss of a leg, or the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred and seventy-five weeks;

16. For the loss of the sight of an eye or for the permanent and complete loss of its use, fifty per centum of the average weekly wage during one hundred weeks;

17. For the permanent partial loss of use of a member or sight of an eye, fifty per centum of the average weekly wage during that proportion of the number of weeks in the foregoing schedule provided for the loss of such member or sight of an eye which the partial loss of use thereof bears to the total loss of use of such member or sight of eye;

18. The loss of both hands, or both arms, or both feet, or both legs, or both eyes, or of any two thereof, shall constitute total and permanent disability, to be compensated according to the compensation fixed by paragraph (f) of this section: Provided, that these specific cases of total and permanent disability shall not be construed as excluding other cases.

(f) In case of complete disability, which renders the employee wholly and permanently incapable of work, compensation equal to fifty per centum of his earnings, but not less than \$6.00 nor more than \$12.00 per week, commencing on the day after the injury and continuing until the amount paid equals the amount which would have been payable as a death benefit under paragraph (a) section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7, and thereafter a pension during life annually equal to 8 per cent of the amount which would have been payable as a death benefit under paragraph (a), section 7, if the employee had died as a result of the injury at the time thereof, leaving heirs surviving, as provided in said paragraph (a), section 7. Such pension shall not be less than \$10.00 per month and shall be payable monthly.

(g) In case death occurs as a result of the injury before the total of the payments made equals the amount payable as a death benefit, then in case the employee leaves any widow, child or children, parents, grandparents, or other lineal heirs, entitled to compensation under section 7, the difference between the compensation for death and the sum of the payments made to the employee

shall be paid, at the option of the employer, either to the personal representative or to the beneficiaries of the deceased employee, and distributed, as provided in paragraph (f) of section 7, but in no case shall the amount payable under this paragraph be less than \$500.00.

(h) In no event shall the compensation to be paid exceed fifty per centum of the average weekly wage or exceed \$12.00 per week in amount; nor, except in cases of complete disability, as defined above, shall any payments extend over a period of more than eight years from the date of the accident. In case an injured employee shall be incompetent at the time when any right or privilege accrues to him under the provisions of this Act, a conservator or guardian may be appointed, pursuant to law, and may, on behalf of such incompetent, claim and exercise any such right or privilege with the same force and effect as if the employee himself had been competent and had claimed or exercised said right or privilege; and no limitations of time by this Act provided shall run so long as said incompetent employee is without a conservator or guardian.

(i) All compensations provided for in paragraphs (b), (c), (d), (e), and (f) of this section, other than cases of pension for life, shall be paid in installments at the same intervals at which the wages or earnings of the employee were paid at the time of the injury, or if this shall not be feasible, then the installments shall be paid weekly.

(j) 1. Wherever in this section there is a provision for fifty per centum, such per centum shall be increased five per centum for each child of the employee under 16 years of age at the time of the injury to the employee until such per centum shall reach a maximum of sixty-five per centum.

2. Wherever in this section a weekly minimum of \$6.00 is provided, such minimum shall be increased in the following cases to the following amounts:

\$6.50 in case of an employee with one child under the age of 16 years at the time of injury to the employee.

\$7.00 in case of an employee with two children under the age of 16 years at the time of injury to the employee.

\$7.50 in case of an employee with three or more children under the age of 16 years at the time of injury to the employee.

3. Wherever in this section a weekly maximum of \$12.00 is provided, such maximum shall be increased in the following cases to the following amounts:

\$13.00 in case of an employee with one child under the age of 16 years at the time of injury to the employee.

\$14.00 in case of an employee with two children under the age of 16 years at the time of injury to the employee.

\$15.00 in case of an employee with three or more children under the age of 16 years at the time of injury to the employee.

4. The increases in the above per centum and the minimum and maximum amounts shall be paid only so long as the child upon which the increase is based remains under the age of 16 years.

SEC. 13. (a) There is hereby created a board which shall be known as the Industrial Board to consist of five members to be appointed by the Governor, by and with the consent of the Senate, two of whom shall be representative citizens of the employing class operating under this Act, and two of whom shall be representative citizens of the class of employees operating under this Act, and one of whom shall be a representative citizen not identified with either the employing or employee classes and who shall be designated by the Governor as chairman. Appointment of members to places on the first board or to fill vacancies on said board may be made during recesses of the Senate, but shall be subject to confirmation by the Senate at the next ensuing session of the Legislature. The term of

office of members of this board shall be six years, expiring on January 31st, of the odd year, except that when first constituted two members shall be appointed for two years, two members for four years and one member for six years. Not more than three members of the board shall belong to the same political party.

(b) When there shall become effective the Act known as "The Civil Administrative Code of Illinois," being an Act entitled, "An Act in relation to the civil administration of the State Government," there shall thereupon be vested in the Industrial Commission and the industrial officers thereof by said Act created all of the powers and duties vested in the Industrial Board by the Workmen's Compensation Act and thereupon whenever in the Workmen's Compensation Act reference shall be made to the Industrial Board, the board or to any member thereof, it shall be construed as referring and shall apply to the said Industrial Commission, the said commission, and any industrial officer thereof, respectively.

SEC. 14. The salary of each of the members of the board so appointed by the Governor shall be five thousand dollars (\$5,000.00) per year. The board shall appoint a secretary and shall employ such assistants and clerical help as may be necessary. The salary of the arbitrators designated by the board shall be at the rate of twenty-four hundred dollars (\$2,400.00) per year. The members of the board and the arbitrators shall have reimbursed to them their actual traveling expenses and disbursements made or incurred by them in the discharge of their official duties while away from their places of residence in the performance of their duties. The board shall provide itself with a seal for the authentication of its orders, awards, and proceedings, upon which shall be inscribed the name of the board and the words "Illinois—Seal."

SEC. 16. The board may make rules and orders for carrying out the duties imposed upon it by law, which rules and orders shall be deemed *prima facie* reasonable and valid; and the process and procedure before the board shall be as simple and summary as reasonably may be. The board, upon application of either party, may issue *dedimus potestatem* directed to a commissioner, notary public, justice of the peace, or any other officer authorized by law to administer oaths, to take the depositions of such witness or witnesses as may be necessary in the judgment of such applicant. Such *dedimus potestatem* may issue to any of the officers aforesaid in any State or Territory of the United States or in any foreign country. The board shall have the power to adopt necessary rules to govern the issue of such *dedimus potestatem*. The board, or any member thereof, or any arbitrator designated by said board, shall have the power to administer oaths, subpoena and examine witnesses, to issue subpoenas *duces tecum*, requiring the production of such books, papers, records, and documents as may be evidence of any matter under inquiry, and to examine and inspect the same and such places or premises as may relate to the question in dispute. Said board, or any member thereof, or any arbitrator designated by said board, shall, on written request of either party to the dispute, issue subpoenas for the attendance of such witnesses and production of such books, papers, records, and documents as shall be designated in said applications, providing, however, that the parties applying for such subpoena shall advance the officer and witness fees provided for in suits pending in the Circuit Court. Service of such subpoenas shall be made by any sheriff or constable or other person. In case any person refuses to comply with an order of the board or subpoena issued by it or any member thereof, or any arbitrator designated by said board, or to permit an inspection of places or premises, or to produce any books, papers, records, or documents, or any witness refuses to testify to any matters regarding which he may be lawfully interrogated, the County Court of the county in which said hearing or matter is pending, on application of any member of the board or any arbitrator designated by the board, shall compel obedience by attachment

proceedings, as for contempt, as in a case of disobedience of the requirements of a subpoena from such court on a refusal to testify therein.

The board, at its expense, shall provide a stenographer to take the testimony and record of proceedings at the hearings before an arbitrator, committee of arbitration, or the board, and said stenographer shall furnish a transcript of such testimony or proceedings to any person requesting it upon payment to him therefor of five cents per one hundred words for the original and three cents per one hundred words for each copy of such transcript.

The board shall have the power to determine the reasonableness and fix the amount of any fee or compensation charged by any person for any service performed in connection with this Act or for which payment is to be made under this Act or rendered in securing any right under this Act.

SEC. 19. Each disputed questions of law or fact upon which the employer and employee or personal representative can not agree shall be determined as herein provided.

(a) It shall be the duty of the Industrial Board, upon notification that the parties have failed to reach an agreement, to designate an arbitrator: Provided, that if the compensation claimed is for a partial permanent or total permanent incapacity or for death, then the dispute may, at the election of either party, be determined by a committee of arbitration, which election for a determination by a committee shall be made by petitioner filing with the board his election in writing with his petition or by the other party filing with the board his election in writing within five days of notice to him of the filing of the petition, and thereupon it shall be the duty of the Industrial Board, upon either of the parties having filed their election for a committee of arbitration as above provided, to notify both parties to appoint their respective representatives on the committee of arbitration. The board shall designate an arbitrator to act as chairman, and if either party fails to appoint its member on the committee within seven days after notification as above provided, the board shall appoint a person to fill the vacancy and notify the parties to that effect. The party filing his election for a committee of arbitration shall with his election deposit with the board the sum of twenty dollars, to be paid by the board to the arbitrators selected by the parties as compensation for their services as arbitrators, and upon a failure to deposit as aforesaid the election shall be void and the determination shall be by an arbitrator designated by the board. The members of the committee of arbitration appointed by either of the parties or one appointed by the board to fill a vacancy by reason of the failure of one of the parties to appoint, shall not be a member of the board or an employee thereof.

(b) The arbitrator or committee of arbitration shall make such inquiries and investigations as he or they shall deem necessary, and may examine and inspect all books, papers, records, places, or premises relating to the questions in dispute, and hear such proper evidence as the parties may submit. The hearings before the arbitrator or committee of arbitration shall be held in the vicinity where the injury occurred, after ten days' notice of the time and place of such hearing shall have been given to each of the parties or their attorneys of record. The decision of the arbitrator or committee of arbitration shall be filed with the Industrial Board, which board shall immediately send to each party or his attorney a copy of such decision, together with a notification of the time when it was filed, and unless a petition for a review is filed by either party within fifteen days after the receipt by said party of the copy of said decision and notification of time when filed, and unless such party petitioning for a review shall within twenty days after the receipt by him of the copy of said decision file with the board either an agreed statement of the facts appearing upon the

hearing before the arbitrator or committee of arbitration, or, if such party shall so elect, a correct stenographic report of the proceedings at such hearings, then the decision shall become the decision of the Industrial Board: Provided, that such Industrial Board may for sufficient cause shown grant further time, not exceeding thirty days, in which to petition for such review or to file such agreed statement or stenographic report. Such agreed statement of facts or correct stenographic report, as the case may be, shall be authenticated by the signatures of the parties or their attorneys, and in the event they do not agree as to the correctness of the stenographic report it shall be authenticated by the signature of the arbitrator designated by the board.

(c) The Industrial Board may appoint, at its expense, a duly qualified, impartial physician to examine the injured employee and report to the board. The fee for this service shall not exceed five dollars and travelling expenses, but the board may allow additional reasonable amounts in extraordinary cases. The fees and the payment thereof of all attorneys and physicians for services authorized by the board under this Act, shall, upon request of either the employer or the employee or the beneficiary affected, be subject to the review and decision of the Industrial Board.

(d) If any employee shall persist in insanitary or injurious practices which tend to either imperil or retard his recovery or shall refuse to submit to such medical or surgical treatment as is reasonably essential to promote his recovery, the board may, in its discretion, reduce or suspend the compensation of any such injured employee.

(e) If a petition for review and agreed statement of facts or stenographic report is filed, as provided herein, the Industrial Board shall promptly review the decision of the arbitrator or committee of arbitration and all questions of law or fact which appear from the said statement of facts or stenographic report, and such additional evidence as the parties may submit. After such hearing upon review the board shall file in its office its decision thereon, and shall immediately send to each party or his attorney a copy of such decision and a notification of the time when it was filed.

Such review and hearing may be held in its office or elsewhere as the board may deem advisable: Provided, that the taking of testimony on such hearing may be had before any member of the board and in the event either of the parties may desire an argument before others of the board, such argument may be had upon written demand therefor filed with the board within five days after the commencement of such taking of testimony, in which event such argument shall be had before not less than a majority of the board: Provided, that the board shall give 10 days' notice to the parties or their attorneys of the time and place of such taking of testimony and of such argument.

In any case the board in its decision may, in its discretion, find specially upon any question or questions of law or fact which shall be submitted in writing by either party, whether ultimate or otherwise. Any party may, within twenty days after the receipt of notice of the board's decision, or within such further time, not exceeding thirty days, as the board may grant, file with the board either an agreed statement of the facts appearing upon the hearing, or, if such party shall so elect, a correct stenographic report of the additional proceedings presented before the board, in which report the party may embody a correct statement of such other proceedings in the case as such party may desire to have reviewed, such statement of facts or stenographic report to be authenticated by the signatures of the parties or their attorneys, and in the event that they do not agree, then the authentication of such stenographic report shall be by the signature of the chairman of the board. The applications for adjustment of

claim and other documents in the nature of pleadings filed by either party, together with the decisions of the arbitrator and of the Industrial Board, and the statement of facts or stenographic reports hereinbefore provided for in paragraphs (b) and (c) shall be the record of the proceedings of said board, and shall be subject to review as hereinafter provided.

(f) The decision of the Industrial Board, acting within its powers, according to the provisions of paragraph (c) of this section, and of the arbitrator or committee of arbitration, where no review is had and his or their decision becomes the decision of the Industrial Board in accordance with the provisions of this section, shall, in the absence of fraud, be conclusive unless reviewed as in this paragraph hereinafter provided.

(1) The Circuit Court of the county where any of the parties defendant may be found shall by writ of certiorari to the Industrial Board have power to review all questions of law presented by such record. Such writ shall be issued by the clerk of such court upon praecipe. Service upon any member of the Industrial Board or the secretary thereof shall be service on the board, and service upon other parties in interest shall be by scire facias, or service may be made upon said board and other parties in interest by mailing notice of the commencement of the proceedings and the return day of the writ to the office of said board and the last-known place of residence of the other parties in interest at least ten days before the return day of said writ; or (2) any party in interest may commence a suit in chancery in the Circuit Court of the county where any of the parties defendant may be found to review the decision of the board only for errors of law appearing on the said record of the said board. Such suit by writ of certiorari or in chancery shall be commenced within twenty days of the receipt of notice of the decision of the board.

(3) No such writ of certiorari shall issue and no such suit in chancery shall be commenced by one against whom the Industrial Board shall have rendered an award for the payment of money unless such one shall upon the filing of his praecipe for such writ or upon the commencement of such suit file with the clerk of said court a bond conditioned that if he shall not successfully prosecute said writ or said suit he will pay the said award and the costs of the proceedings in said court. The amount of the bond shall be fixed by any member of the Industrial Board and the surety or sureties on said bond shall be approved by the clerk of said court.

The court may confirm or set aside the decision of the arbitrator or committee of arbitration or Industrial Board. If the decision is set aside and the facts found in the proceedings before the board are sufficient, the court may enter such decision as is justified by law, or may remand the cause to the Industrial Board for further proceedings and may state the questions requiring further hearing, and give such other instructions as may be proper.

Judgments, orders and decrees of the Circuit Court under this Act shall be reviewed only by the Supreme Court upon writ of error. Upon motion the trial court shall enter of record a certificate that the cause is, or is not, in his opinion, one proper to be reviewed by the Supreme Court. Upon filing with the clerk of the Supreme Court a certified copy of such a certificate that the cause is one proper to be reviewed, writ of error shall issue. If the trial court certifies that the cause is not one proper to be reviewed, the Supreme Court, in its discretion, or one of the judges of said court in vacation, may, nevertheless, order that a writ of error issue. A writ of error, when issued, shall operate as a supersedeas.

* The Secretary of State certifies that the word "not" in the official session law is a typographical error.

The decision of a majority of the members of a committee of arbitration or of the Industrial Board shall be considered the decision of such committee or board, respectively.

(g) Either party may present a certified copy of the decision of the Industrial Board, when no proceedings for review thereof have been taken, or of the decision of such arbitrator or committee of arbitration when no claim for review is made, or of the decision of the Industrial Board after hearing upon review, providing for the payment of compensation according to this Act, to the Circuit Court of the county in which such accident occurred or either of the parties are residents, whereupon such court shall render a judgment in accordance therewith; and in case where the employer does not institute proceedings for review of the decision of the Industrial Board and refuses to pay compensation according to the award upon which such judgment is entered, the court shall, in entering judgment thereon, tax as costs against him the reasonable costs and attorney fees in the arbitration proceedings and in the court entering the judgment, for the person in whose favor the judgment is entered, which judgment and costs, taxed as herein provided, shall, until and unless set aside, have the same effect as though duly rendered in an action duly tried and determined by said court, and shall, with like effect be entered and docketed. The Circuit Court shall have power, at any time, upon application, to make any such judgment conform to any modification required by any subsequent decision of the Supreme Court upon appeal, or as the result of any subsequent proceedings for review, as provided in this Act.

Judgment shall not be entered until fifteen days' notice of the time and place of the application for the entry of judgment shall be served upon the employer by filing such notice with the Industrial Board; which board shall, in case it has on file the address of the employer or the name and address of its agent, upon whom notices may be served, immediately send a copy of the notice to the employer or such designated agent; and no judgment shall be entered in the event the employer shall file with the said board its bond, with good and sufficient surety in double the amount of the award, conditioned upon the payment of said award in the event the said employer shall fail to prosecute with effect proceedings for review of the decision, or the said decision, upon review, shall be affirmed.

(h) An agreement or award under this Act, providing for compensation in installments, may at any time within eighteen months after such agreement or award be reviewed by the Industrial Board at the request of either the employer or the employee on the ground that the disability of the employee has subsequently recurred, increased, diminished, or ended; and on such review compensation payments may be reestablished, increased, diminished, or ended: Provided, that the board shall give fifteen days' notice to the parties of the hearing for review: And provided further, any employee, upon any petition for such a review being filed by the employer, shall be entitled to one day's notice for each one hundred miles necessary to be traveled by him in attending the hearings of the board upon said petition and three days in addition thereto, and such employee shall, at the discretion of the board, also be entitled to five cents per mile necessarily traveled by him in attending such hearing, not to exceed a distance of 300 miles, to be taxed by the board as costs and deposited with the petition of the employer.

(i) Each party, upon taking any proceedings or steps whatsoever before any arbitrator, committee of arbitration, Industrial Board or court, shall file with the Industrial Board his address, or the name and address of an agent upon whom all notices to be given to such party shall be served, either personally or by registered mail addressed to such party or agent at the last address so filed

with the Industrial Board: Provided, that in the event such party has not filed his address, or the name and address of an agent, as above provided, service of any notice may be had by filing such notice with the Industrial Board.

(J) Whenever in any proceeding testimony has been taken or a final decision has been rendered, and after the taking of such testimony, or after such decision has become final, the injured employee dies, then in any subsequent proceeding brought by the personal representative or beneficiaries of the deceased employee, such testimony in the former proceeding may be introduced with the same force and effect as though the witness having so testified were present in person in such subsequent proceeding and such final decision, if any, shall be taken as a final adjudication of any of the issues which are the same in both proceedings.

SEC. 31. Any one engaging in any business or enterprise referred to in subsections 1 and 2 of paragraph (b) of section 3 of this Act who undertakes to do any work enumerated therein, shall be liable to pay compensation to his own immediate employees in accordance with the provisions of this Act, and in addition thereto if he directly or indirectly engages any contractor, whether principal or subcontractor to do any such work, he shall be liable to pay compensation to the employees of any such contractor or subcontractor unless such contractor or subcontractor shall have insured, in any company or association authorized under the laws of this State to insure the liability to pay compensation under this Act, or guaranteed his liability to pay such compensation.

In the event any such person shall pay compensation under this section he may recover the amount thereof from the contractor or subcontractor, if any, and in the event the contractor shall pay compensation under this section he may recover the amount thereof from the subcontractor, if any.

This section shall not apply in any case where the accident occurs elsewhere than on, in or about the immediate premises on which the principal has contracted that the work shall be done.

SEC. 2. Whereas, an emergency exists, therefore, this Act shall be in force and effect from and after its passage and approval by the Governor.

WORKMEN'S COMPENSATION ACT.

SECOND AMENDATORY ACT.

LAWS 1917, P. 505.

JUNE 28, 1917.

AN ACT To amend an Act entitled "An Act, etc." (same as in section 1).

SEC. 1. Be it enacted, etc.:

That an Act entitled "An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment within this State, providing for the enforcement and administering thereof, and a penalty for its violation, and repealing an Act entitled 'An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment, approved June 10, 1911, in force May 1, 1912,' " approved June 28, 1913, in force July 1, 1913, as subsequently amended be, and the same is hereby, amended by repealing section two (2) thereof and by amending sections one (1), three (3), four (4), eleven (11), thirteen (13), twenty-six (26), twenty-nine (29), and thirty-two (32) thereof to read as follows:

SEC. 1. That any employer in this State who does not come within the classes enumerated by section three (3) of this Act may elect to provide and pay compensation for accidental injuries sustained by any employee arising out of and in the course of the employment according to the provisions of this Act, and thereby relieve himself from any liability for the recovery of damages, except as herein provided.

(a) Election by any employer to provide and pay compensation according to the provisions of this Act shall be made by the employer filing notice of such election with the Industrial Board.

(b) Every employer, within the provisions of this Act, who has elected to provide (provide) and pay compensation according to the provisions of this Act, shall be bound thereby as to all his employees covered by this Act until January 1st of the next succeeding year and for terms of each year thereafter; Provided, any such employer who may have once elected, may elect not to provide and pay the compensation herein provided for accidents resulting in either injury or death and occurring after the expiration of any such calendar year by filing notice of such election with the Industrial Board at least sixty days prior to the expiration of any such calendar year, and by posting such notice at a conspicuous place in the plant, shop, office, room, or place where such employee is employed, or by personal service, in written or printed form, upon such employee at least sixty (60) days prior to the expiration of any such calendar year.

(c) In the event any employer mentioned in this section elects to provide and pay the compensation provided in this Act, then every employee of such employer, as a part of his contract of hiring, or who may be employed at the time of the taking effect of this Act and the acceptance of its provisions by such employer, shall be deemed to have accepted all the provisions of this Act and shall be bound thereby unless within thirty (30) days after such hiring, or after the taking effect of this Act, and its acceptance by such employer, he shall file a notice to the contrary with the Industrial Board, whose duty it shall be to immediately notify the employer, and until such notice to the contrary is given to the employer, the measure of liability of such employer shall be determined according to the compensation provisions of this Act: Provided, however, That any employee may withdraw from the operation of this Act upon filing a written notice of withdrawal at least ten (10) days prior to January 1st of any year with the Industrial Board, whose duty it shall be to immediately notify such employer by registered mail, and, until such notice to the contrary is given to such employer, the measure of liability of such employer shall be determined according to the compensation provisions of this Act.

(d) Any such employer or employee may, without prejudice to any existing right or claim, withdraw his election to reject this Act by giving thirty (30) days' written notice in such manner and form as may be provided by the Industrial Board.

Sec. 3. The provisions of this Act hereinafter following shall apply automatically, and without election, to all employers and their employees engaged in any of the following enterprises or businesses, which are hereby declared to be extra hazardous, namely:

1. The erection, maintaining, removing, remodeling, altering, or demolishing of any structure, except as provided in subsection 8 of this section.

2. Construction, excavating, or electrical work, except as provided in subsection 8 of this section.

3. Carriage by land or water and loading or unloading in connection therewith.

4. The operation of any warehouse or general or terminal storehouses.

5. Mining, surface mining, or quarrying.

6. Any enterprise in which explosive materials are manufactured, handled, or used in dangerous quantities.

7. In any enterprise wherein molten metal, or explosive or injurious gases or vapors, or inflammable vapors or fluids, or corrosive acids are manufactured, used, generated, stored, or conveyed in dangerous quantities.

8. In any enterprise in which statutory or municipal ordinance regulations are now or shall hereafter be imposed for the regulating, guarding, use, or the

placing of machinery or appliances, or for the protection and safeguarding of the employees or the public therein; each of which occupations, enterprises, or business are hereby declared to be extra hazardous; Provided, nothing contained herein shall be construed to apply to any work, employment, or operations done, had, or conducted by farmers and others engaged in farming, tillage of the soil, or stock raising, or to those who rent, demise or lease land for any such purposes, or to anyone in their employ, or to any work done on a farm or country place, no matter what kind of work or service is being done or rendered.

SEC. 4. The term "employer" as used in this Act shall be construed to be:

First: The State, and each county, city, town, township, incorporated village, school district, body, politic, or municipal corporation therein.

Second: Every person, firm, public or private corporation, including hospitals, public service, eleemosynary, religious or charitable corporations or associations who has any person in service or under any contract for hire, express or implied, oral or written, and who is engaged in any of the enterprises or businesses enumerated in section three (3) of this Act, or who at or prior to the time of the accident to the employee for which compensation under this Act may be claimed, shall, in the manner provided in this Act, have elected to become subject to the provisions of this Act, and who shall not, prior to such accident, have effected a withdrawal of such election in the manner provided in this Act.

SEC. 11. The compensation herein provided, together with the provisions of this Act shall be the measure of the responsibility of any employer engaged in any of the enterprises or businesses enumerated in section three (3) of this Act, or of any employer who is not engaged in any such enterprises or businesses, but who has elected to provide and pay compensation for accidental injuries sustained by any employee arising out of and in the course of the employment according to the provisions of this act, and whose election to continue under this Act, has not been nullified by any action of his employees as provided for in this act.

SEC. 13. (a) There is hereby created a board which shall be known as the Industrial Board to consist of five members to be appointed by the Governor, by and with the consent of the Senate, two of whom shall be representative citizens of the employing class operating under this Act, and two of whom shall be representative citizens of the class of employees operating under this Act, and one of whom shall be a representative citizen not identified with either the employing or employee classes and who shall be designated by the Governor as chairman. Appointment of members to places on the first board or to fill vacancies on said board may be made during recesses of the Senate, but shall be subject to confirmation by the Senate at the next ensuing session of the Legislature.

(b) When there shall become effective the Act known as "The Civil Administrative Code of Illinois," being an Act entitled "An Act in relation to the civil administration of the state Government," there shall thereupon be vested in the Industrial Commission and the Industrial officers thereof by said Act created, all of the powers and duties vested in the Industrial Board by the Workmen's Compensation Act, and thereupon wherever in the Workmen's Compensation Act reference shall be made to the Industrial Board, the board, or to any member thereof, it shall be construed as referring and shall apply to the said Industrial Commission, the said commission, and any Industrial officer thereof, respectively.

SEC. 26. (a) Any employer who shall come within the provisions of section three (3) of this Act and any other employer who shall elect to provide and pay the compensation provided for in this Act, shall, within ten (10) days of receipt by the employer of a written demand by the Industrial Board (1) file with the board a sworn statement showing his financial ability to pay the com-

compensation provided for in this Act, normally required to be paid, or (2) furnish security, indemnity, or a bond guaranteeing the payment by the employer of the compensation provided for in this Act normally required to be paid, or (3) insure to a reasonable amount his normal liability to pay such compensation in some corporation, association, or organization authorized, licensed or permitted to do such insurance business in this State, or (4) make some other provisions for the securing of the payment of compensation provided for in this Act, normally required to be paid, and shall, within twenty (20) days of the receipt of such written demand, furnish to the board evidence of his compliance with one of the above alternatives: Provided, that the sworn statement of financial ability, or security, indemnity or bond, or amount of insurance or other provisions filed, furnished, carried, or made by the employer, as the case may be, shall be subject to the approval of the board, upon the approval of which the board shall send to the employer written notice of its approval thereof; And provided further, that demand shall not be made upon the employer by the board oftener than once in any calendar year.

(b) If no sworn statement or no security, indemnity, bond, or no insurance is filed, furnished, or carried, or other provisions made by the employer within ten (10) days of receipt by the employer of the written demand provided for in paragraph (a), or if the statement, security, indemnity bond or amount of insurance filed, furnished or carried, or other provision made by the employer, as provided in paragraph (a) shall not be approved by the board, and written notice of such nonapproval shall be given to the employer and the employer shall not comply with one of the alternatives of paragraph (a) of this section within ten (10) days after the receipt by the employer of such written notice of nonapproval, then the employer shall be liable for compensation to any injured employee, or his personal representative, according to the terms of this Act, or for damages in the same manner as if this Act had not been passed, at the option of such employee or his personal representative: Provided, that it shall be no defense in favor of such employer in such case that (1) the employee assumed the risks of the employment, (2) the injury or death was caused in whole or in part by the negligence of a fellow servant, (3) the injury or death was proximately caused by the contributory negligence of the employees: Provided, such option is exercised, and written notice thereof is given to the employer within thirty (30) days after the accident to such employee; otherwise the employer shall be liable only for the compensation payable according to the provisions of this Act: And, provided, further, that if at any time thereafter the employer shall comply with any of the alternatives of paragraph (a), then, as to all accidents occurring after the said compliance, the employer shall only be liable for compensation according to the terms of this Act: And, provided, further, that upon the failure of any employer to comply with the provisions of this section the Industrial Board may, for the purpose of furnishing notice to the employees of such employer, publish the fact of such failure by such employer in any newspaper having a general circulation in the county where such employer does business.

SEC. 29. Where an injury or death for which compensation is payable by the employer under this Act was not proximately caused by the negligence of the employer or his employees, and was caused under circumstances creating a legal liability for damages in some person other than the employer to pay damages, such other person having also elected to be bound by this Act, or being bound thereby under section three (3) of this Act, then the right of the employee or personal representative to recover against such other person shall be subrogated to his employer, and such employer may bring legal proceedings against such other person to recover the damages sustained in an amount not exceeding the

aggregate amount of compensation payable under this Act, by reason of the injury or death of such employee. Where the injury or death for which compensation is payable under this Act was not proximately caused by the negligence of the employer or his employees, and was caused under circumstances creating a legal liability for damages on the part of some person other than the employer to pay damages, such other person having elected not to be bound by this Act, then legal proceedings may be taken against such other person to recover damages, notwithstanding such employer's payment of or liability to pay compensation under this Act; but in such case if the action against such other person is brought by the injured employee or his personal representative and judgment is obtained and paid, or settlement is made with such other person, either with or without suit, then from the amount received by such employee or personal representative there shall be paid to the employer the amount of compensation paid or to be paid by him to such employee or his personal representative: Provided, that if the injured employee or his personal representative shall agree to receive compensation from the employer or to institute proceedings to recover the same or accept from the employer any payment on account of such compensation, such employer shall be subrogated to all the rights of such employee or personal representative, and may maintain, or in case an action has already been instituted, may continue an action either in the name of the employee or personal representative or in his own name against such other person for the recovery of damages to which but for this section the said employee or personal representative would be entitled, but such employer shall nevertheless pay over to the injured employee or personal representative all sums collected from such other person by judgment or otherwise in excess of the amount of such compensation paid or to be paid under this Act, and all costs, attorneys' fees, and reasonable expenses incurred by such employer in making such collection and enforcing such liability.

SEC. 32. If any of the provisions of this Act providing for compensation for injuries to or death of employees shall be repealed or adjudged invalid or unconstitutional, the period intervening between the occurrence of any injury or death and such repeal or final adjudication of invalidity, shall not be computed as a part of the time limited by law for the commencement of any action relating to such injury or death, but the amount of any compensation which may have been paid for any such injury shall be deducted from any judgment for damages recovered on account of such injury. Any claim, disagreement or controversy existing or arising under "An Act to promote the general welfare of the people of this State, by providing compensation for accidental injuries or death suffered in the course of employment," approved June 10, 1911, in force May 1, 1912, shall be adjusted in accordance with the provisions of said Act, notwithstanding the repeal thereof, or may by agreement of the parties be adjusted in accordance with the method of procedure provided in this Act for the adjustment of differences, jurisdiction to adjust such differences so submitted by the parties being hereby conferred upon the Industrial Board or committee of arbitration provided for in this Act. (See page 394.)

SEC. 2. Section two of an Act entitled "An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment within this State; providing for the enforcement and administering thereof, and a penalty for its violation, and repealing an Act entitled 'An Act to promote the general welfare of the people of this State by providing compensation for accidental injuries or death suffered in the course of employment, approved June 10, 1911, in force May 1, 1912,'" approved June 28, 1913, in force July 1, 1913, as subsequently amended, is hereby repealed.

PUBLICATIONS RELATING TO MINING LAWS.

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CONTENTS OF ENTIRE INDEX.

	Page.
Session Laws Compiled and Annotated.....	468
Constitution.....	472
Revised Statutes 1845.....	473
Callaghan Statutes.....	474
Courtright Statutes.....	475
Hurd's Revised Statutes.....	477
Jones & Addington Statutes.....	496
Starr & Curtiss Statutes.....	498
Table of Illinois Cases.....	502
Table of Foreign Cases.....	509
Index.....	511

SESSION LAWS COMPILED AND ANNOTATED.

	Page
Laws 1817-18 (Territory) p. 27.....	December 29, 1817..... Salines..... 350
Laws 1819, p. 7.....	February 6, 1819..... Salines..... 360
Laws 1819, p. 114.....	March 4, 1819..... Salines..... 360
Laws 1819, p. 165.....	March 22, 1819..... Saline..... 361
Laws 1819, p. 236.....	March 24, 1819..... Salines..... 361
Laws 1820-21, p. 103.....	February 8, 1821..... Salines..... 362
Laws 1822-23, p. 76.....	January 3, 1823..... Salines..... 363
Laws 1822-23, p. 133.....	February 12, 1823..... Salines..... 364
Laws 1824-25, p. 8.....	December 11, 1824..... Salines..... 364
Laws 1824-25, p. 10.....	December 24, 1824..... Salines..... 365
Laws 1824-25, p. 49.....	January 3, 1825..... Salines..... 365
Laws 1824-25, p. 118.....	January 15, 1825..... Salines..... 365
Laws 1826-27, p. 361.....	February 2, 1827..... Salines..... 366
Revised Code.	
Laws 1828-29, p. 142.....	December 19, 1828..... Salines..... 368
Laws 1830-31, p. 165.....	December 25, 1830..... Salines..... 369
Revised Code.	
Laws 1830-31, p. 162.....	January 11, 1831..... Salines..... 369
Revised Code.	
Laws 1830-31, p. 163.....	January 26, 1831..... Salines..... 370
Revised Code.	
Laws 1835-36, p. 263.....	January 16, 1836..... Salines..... 371
Laws 1840-41, p. 291.....	December 9, 1840..... Salines..... 372
Laws 1840-41, p. 292.....	February 26, 1841..... Salines..... 373
Laws 1840-41, p. 294.....	February 27, 1841..... Salines..... 374
Laws 1846-47, p. 114.....	February 23, 1847..... Salines..... 374
Laws 1846-47, p. 168.....	February 18, 1847..... Weight of coal..... 383
Laws 1846-47, p. 176.....	Geologist..... 19
Laws 1849, p. 87.....	February 10, 1849..... Mining corporations..... 114
Laws 1851, p. 154.....	February 17, 1851..... Geologist..... 19
Laws 1852, p. 135.....	June 22, 1852..... Mining corporations..... 115
Laws 1853, p. 237.....	February 12, 1853..... Geologist..... 20
Laws 1855, p. 176.....	February 14, 1855..... Weighing coal..... 383
Laws 1857, p. 98.....	February 18, 1857..... Mining corporations..... 115
Laws 1857, p. 161.....	February 18, 1857..... Mining corporations..... 119
Laws 1859, p. 28.....	February 24, 1859..... Mining corporations..... 119
Laws 1859, p. 126.....	February 18, 1859..... Mineral lands..... 60
Laws 1861, p. 140.....	February 25, 1861..... Minerals..... 57
Laws 1861, p. 146.....	February 20, 1861..... Mining rights—Conveyance..... 343
Laws 1863, p. 70.....	February 13, 1863..... Mineral lands..... 58
Laws 1865, p. 23.....	February 16, 1865..... Mining corporations..... 118
Laws 1867, p. 10.....	February 28, 1867..... Geologist..... 21
Laws 1867, p. 39.....	February 21, 1867..... Eminent domain..... 5
Extra session.	
Laws 1869, p. 47.....	March 11, 1869..... Geologist..... 21
Laws 1869, p. 259.....	April 19, 1869..... Oil..... 346
Laws 1871-72, 1, p. 11.....	March 30, 1872..... Taxation..... 381
Laws 1871-72, p. 166.....	April 3, 1872..... Geologist..... 21
Laws 1871-72, p. 566.....	April 9, 1872..... Oil..... 347
Laws 1871-72, p. 568.....	March 27, 1872..... Mining operations..... 128
Laws 1873, p. 14.....	April 23, 1873..... Geologist..... 22
Laws 1873, p. 76.....	March 19, 1873..... Mineral lands..... 58
Laws 1873, p. 98.....	April 29, 1873..... Geologist..... 20
Laws 1873, p. 110.....	April 24, 1873..... Mining operations..... 133
Laws 1873, p. 126.....	April 24, 1873..... Mining operations..... 132
Laws 1873-74, p. 17.....	April 23, 1873..... Geologist..... 22
Laws 1873-74, p. 18.....	March 26, 1874..... Geologist..... 22
Laws 1873-74, p. 93.....	March 19, 1873..... Mineral lands..... 58

			Page.
Laws 1873-74, p. 106.....	April 29, 1873.....	Geologist.....	20
Laws 1873-74, p. 122.....	April 24, 1873.....	Mining operations.....	133
Laws 1874 (Hurd), p. 731.....	March 12, 1874.....	Oil.....	349
Laws 1874 (Hurd), p. 709.....	March 24, 1874.....	Eminent domain.....	6
Laws 1874 (Hurd), p. 709.....	March 24, 1874.....	Mineral lands—Trespass.....	60
Laws 1874 (Hurd), p. 709.....	March 24, 1874.....	Minerals.....	57
Laws 1874 (Hurd), p. 709.....	March 24, 1874.....	Mining rights—Conveyance.....	348
Laws 1874 (Hurd), 352, p. 385.....	March 27, 1874.....	Explosives.....	11
Laws 1874 (Hurd), p. 1098.....	February 27, 1874.....	Weight of coal.....	385
Laws 1877, p. 96.....	May 16, 1877.....	Eminent domain.....	7
Laws 1877, p. 139.....	May 23, 1877.....	Mining operations.....	133
Laws 1879, p. 120.....	May 29, 1879.....	Eminent domain.....	8
Laws 1879, p. 204.....	May 28, 1879.....	Mining operations.....	141
Laws 1879, p. 251.....	May 13, 1879.....	Taxation.....	382
Laws 1881, p. 17.....	May 26, 1881.....	Geologist.....	22
Laws 1883, p. 113.....	June 14, 1883.....	Weighing coal.....	386
Laws 1883, p. 114.....	June 21, 1883.....	Mining operations.....	180
Laws 1883, p. 116.....	June 18, 1883.....	Mining operations.....	146
Laws 1885, p. 30.....	June 27, 1885.....	Geologist.....	23
Laws 1885, pp. 78-107.....	June 27, 1885.....	Eminent domain.....	8
Laws 1885, p. 109.....	June 30, 1885.....	Eminent domain.....	8
Laws 1885, p. 217.....	June 30, 1885.....	Mining operations.....	151
Laws 1885, p. 221.....	June 29, 1885.....	Weighing coal.....	388
Laws 1887, p. 96.....	June 6, 1887.....	Oil.....	354
Laws 1887, p. 180.....	June 16, 1887.....	Explosives.....	11
Laws 1887, p. 231.....	June 16, 1887.....	Mining operations.....	155
Laws 1887, p. 235.....	June 17, 1887.....	Weighing coal.....	389
Laws 1887, p. 242.....	June 17, 1887.....	Oil.....	350
Laws 1889, p. 152.....	May 28, 1889.....	Explosives.....	13
Laws 1889, p. 202.....	June 4, 1889.....	Mining operations.....	159
Laws 1891, p. 167.....	June 18, 1891.....	Mine inspectors.....	48
Laws 1891, p. 168.....	June 18, 1891.....	Mine managers.....	54
Laws 1891, p. 170.....	June 10, 1891.....	Weighing coal.....	391
Laws 1891, p. 170.....	June 16, 1891.....	Weighing coal.....	391
Laws 1891, p. 206.....	June 11, 1891.....	Mining corporations.....	120
Laws 1891, p. 212.....	May 28, 1891.....	Miners' wages.....	106
Laws 1891, p. 213.....	April 23, 1891.....	Miners' wages.....	107
Laws 1893, 52, p. 62.....	June 15, 1893.....	Mine inspectors.....	50
Laws 1893, p. 89.....	June 20, 1893.....	Mining corporations.....	120
Laws 1893, p. 165.....	June 21, 1893.....	Mining corporations.....	123
Laws 1893, p. 172.....	June 19, 1893.....	Taxation.....	382
Laws 1895, 51, p. 59.....	June 15, 1895.....	Board of Examiners (Mine Inspectors).....	51
Laws 1895, p. 242.....	June 21, 1895.....	Miners' men.....	105
Laws 1895, p. 250.....	June 21, 1895.....	Fire bosses and hoisting engineers.....	56
Laws 1895, p. 252.....	June 15, 1895.....	Mining operations.....	162
Laws 1895, p. 255.....	June 4, 1895.....	Mine inspectors.....	48
Laws 1895, p. 255.....	June 21, 1895.....	Mine managers.....	55
Laws 1895, p. 256.....	April 30, 1895.....	Oil.....	354
Laws 1895, p. 258.....	June 21, 1895.....	Mining operations.....	164
Laws 1897, 52, p. 61.....	June 5, 1897.....	Mine inspectors.....	51
Laws 1897, p. 268.....	June 7, 1897.....	Examination of miners.....	92
Laws 1897, p. 269.....	June 7, 1897.....	Mining operations.....	166
Laws 1897, p. 270.....	June 3, 1897.....	Miners' wages.....	109
Laws 1897, p. 285.....	June 11, 1897.....	Mining corporations.....	123
Laws 1897, p. 298.....	June 10, 1897.....	Mining corporations.....	120
Laws 1899, 55, p. 62.....	April 19, 1899.....	Mine inspectors.....	51
Laws 1899, p. 301.....	April 18, 1899.....	Mine inspectors.....	49
Laws 1899, p. 301.....	April 18, 1899.....	Miners' examining board.....	62
Laws 1899, p. 301.....	April 18, 1899.....	Mining operations.....	157
Laws 1899, p. 301.....	April 18, 1899.....	Weighing coal.....	392
Laws 1899, p. 301.....	April 18, 1899.....	Miners' examining board—Examination of inspectors.....	62
Laws 1901, 78, p. 85.....	May 10, 1901.....	Mine inspectors.....	51
Laws 1901, 78, p. 85.....	May 10, 1901.....	State mining board.....	51
Laws 1901, p. 247.....	May 11, 1901.....	Oil.....	355

		Page.
Laws 1903, 69, p. 78.....	May 16, 1903.....	Mine inspectors..... 51
Laws 1903, p. 159.....	May 15, 1903.....	Explosives..... 13
Laws 1903, p. 250.....	May 13, 1903.....	Mining operations..... 280
Laws 1903, p. 250.....	May 14, 1903.....	Miners' examining board..... 65
Laws 1903, p. 252.....	May 14, 1903.....	Explosives..... 15
Laws 1903, p. 252.....	May 14, 1903.....	Miners' washrooms..... 111
Laws 1905, p. 30.....	May 12, 1905.....	Geologist..... 26
Laws 1905, 62, p. 69.....	May 18, 1905.....	Mine inspectors..... 52
Laws 1905, 62, p. 69.....	May 18, 1905.....	Miners' examining board..... 91
Laws 1905, p. 324.....	May 13, 1905.....	Mining operations..... 288
Laws 1905, p. 325.....	May 13, 1905.....	Mining operations..... 293
Laws 1905, p. 325.....	May 12, 1905.....	Miners' examining board..... 65
Laws 1905, p. 325.....	May 13, 1905.....	Mining operations..... 294
Laws 1905, p. 326.....	May 13, 1905.....	Mining operations..... 295
Laws 1905, p. 326.....	May 16, 1905.....	Oil..... 256
Laws 1905, p. 328.....	May 18, 1905.....	Shot firers..... 376
Laws 1905, p. 329.....	May 13, 1905.....	Mining operations..... 294
Laws 1905, p. 330.....	May 16, 1905.....	Board of examiners (mine inspectors)..... 51
Laws 1905, p. 353.....	May 18, 1905.....	Taxation..... 353
Laws 1907, p. 387.....	May 27, 1907.....	Mining operations..... 295
Laws 1907, p. 387.....	May 27, 1907.....	Miners' examining board..... 67
Laws 1907, p. 394.....	May 25, 1907.....	Mining operations..... 297
Laws 1907, p. 396.....	May 17, 1907.....	Mining operations..... 298
Laws 1907, p. 397.....	May 25, 1907.....	Mining operations..... 299
Laws 1907, p. 398.....	May 18, 1907.....	Mining operations..... 210
Laws 1907, p. 400.....	May 27, 1907.....	Mining leases Release..... 126
Laws 1907, p. 401.....	May 20, 1907.....	Shot firers..... 377
Laws 1907, p. 401.....	May 24, 1907.....	Explosives..... 16
Laws 1907-8, 17, p. 25 (Adjourned sess.)	June 4, 1907.....	Miners' examining board..... 90
Laws 1907-8, 17, p. 25 (Adjourned sess.)	June 4, 1907.....	Mine inspectors..... 52
Laws 1907 8, 17, p. 29 (Adjourned sess.)	June 4, 1907.....	Geologist..... 26
Laws 1907-8, p. 90. (Adjourned Session)	June 1, 1908.....	Examination of miners..... 92
Laws 1909, p. 43.....	June 8, 1909.....	Mining engineering department..... 10
Laws 1909, p. 55.....	June 10, 1909.....	Mining investigating commission..... 124
Laws 1909, 77, p. 85.....	June 16, 1909.....	Miners' examining board..... 90
Laws 1909, 77, p. 85.....	June 16, 1909.....	Mine inspectors..... 52
Laws 1909, p. 284.....	June 5, 1909.....	Examination of miners..... 91
Laws 1909-10, p. 2.....	March 4, 1910.....	Mine fire fighting and rescue stations..... 28
Laws 1909-10, p. 84.....	March 8, 1910.....	Mine fire-fighting equipment..... 33
Laws 1911, p. 69.....	May 10, 1911.....	Mine inspectors..... 32
Laws 1911, 90, p. 101.....	June 10, 1911.....	Miners' examining board—Examination of inspectors..... 90
Laws 1911, 90, p. 101.....	June 10, 1911.....	Mine inspectors..... 52
Laws 1911, 90, p. 107.....	June 10, 1911.....	Geologist..... 26
Laws 1911, p. 315.....	June 10, 1911.....	Workmen's compensation act..... 394
Laws 1911, p. 329.....	May 25, 1911.....	Miners' institutes..... 104
Laws 1911, p. 385.....	June 7, 1911.....	Explosives..... 16
Laws 1911, p. 388.....	June 6, 1911.....	Mine inspectors..... 49
Laws 1911, p. 388.....	June 6, 1911.....	Miners' examining board..... 70
Laws 1911, p. 388.....	June 6, 1911.....	Mining operations..... 212
Laws 1911, p. 388.....	June 6, 1911.....	Weighing coal..... 391
Laws 1911, p. 419.....	June 7, 1911.....	Mine fire-fighting equipment..... 34
Laws 1911, p. 424.....	June 5, 1911.....	Mine fire fighting and rescue stations..... 29
Laws 1911, p. 426.....	June 7, 1911.....	Oil..... 257
Laws 1911, p. 432.....	May 29, 1911.....	Oil..... 251
Laws 1911, p. 517.....	May 25, 1911.....	Geologist..... 25
Laws 1911-12, 20, p. 23.....	June 6, 1912.....	Mine inspectors..... 52
Laws 1911-12, 20, p. 21.....	June 6, 1912.....	Miners' examining board..... 90
Laws 1911-12, 20, p. 37.....	June 6, 1912.....	Geologist..... 26
Laws 1911-12, 20, p. 40.....	June 6, 1912.....	Mine fire-fighting and rescue stations..... 32
Laws 1913, p. 43.....	June 21, 1913.....	Mining investigating commission..... 124
Laws 1913, 95, p. 107.....	June 30, 1913.....	Mine inspectors..... 53
Laws 1913, 95, p. 107.....	June 30, 1913.....	State mining board..... 91
Laws 1913, 95, p. 112.....	June 30, 1913.....	Geologist..... 27
Laws 1913, 95, p. 116.....	June 30, 1913.....	Mine fire fighting and rescue stations..... 32

			Page.
Laws 1912, 95, p. 119.....	June 30, 1913.....	Miners' institute.....	104
Laws 1912, p. 337.....	June 28, 1913.....	Workmen's compensation act.....	408
Laws 1912, p. 358.....	June 21, 1913.....	Miners' wages.....	110
Laws 1912, p. 359.....	June 26, 1913.....	Miner's washroom.....	111
Laws 1912, p. 412.....	June 27, 1913.....	Mining operations.....	229
Laws 1912, p. 412.....	June 27 (26), 1913.....	Mine inspectors.....	49
Laws 1912, p. 412.....	June 27, 1913.....	Miners' examining board.....	77
Laws 1912, p. 431.....	June 26, 1913.....	Explosives.....	17
Laws 1912, p. 433.....	June 27, 1913.....	Mine fire fighting and rescue stations.....	30
Laws 1912, p. 434.....	June 26, 1913.....	Mine fire-fighting equipment.....	42
Laws 1912, p. 437.....	July 12, 1913.....	Mining leases—Release.....	126
Laws 1912, p. 438.....	June 27, 1913.....	Examination of miners.....	96
Laws 1912, p. 442.....	June 27, 1913.....	Shot firers.....	378
Laws 1912, p. 442-443.....	June 27, 1913.....	Oil.....	351
Laws 1915, p. 80.....	June 29, 1915.....	Mining investigating commission.....	124
Laws 1915, 208, p. 215.....	June 29, 1915.....	Mine inspectors.....	58
Laws 1915, 208, p. 215.....	June 29, 1915.....	State mining board.....	91
Laws 1915, p. 370.....	June 25, 1915.....	Explosives.....	14
Laws 1915, p. 400.....	June 28, 1915.....	Workmen's compensation act.....	418
Laws 1915, p. 505.....	June 28, 1915.....	Mine inspectors.....	50
Laws 1915, p. 505.....	June 28, 1915.....	Mining operations.....	238
Laws 1915, p. 505.....	June 28, 1915.....	Miners' examining board.....	84
Laws 1915, p. 522.....	June 23, 1915.....	Mine fire-fighting equipment.....	44
Laws 1915, p. 525.....	June 29, 1915.....	Examination of miners.....	99
Laws 1915, p. 527.....	June 23, 1915.....	Mine fire fighting and rescue stations.....	31
Laws 1915, p. 531.....	June 29, 1915.....	Oil.....	352
Laws 1917, p. 4.....	March 7, 1917.....	Department of mines and minerals.....	437
Laws 1917, 158, p. 174.....	June 29, 1917.....	Department of mines and minerals.....	440
Laws 1917, 241.....	June 26, 1917.....	Burying dead miners.....	1
Laws 1917, p. 483.....	May 24, 1917.....	Workmen's compensation act.....	447
Laws 1917, p. 505.....	June 25, 1917.....	Workmen's compensation act.....	459
Laws 1917, p. 506.....	June 27, 1917.....	Mine fire-fighting equipment.....	441
Laws 1917, p. 509.....	June 27, 1917.....	Mining investigating commission.....	443
Laws 1917, p. 502.....	June 27, 1917.....	Mining operations (ventilation).....	445

CONSTITUTION.

SECTIONS COMPILED AND ANNOTATED.

	Page
Constitution 1870, art. 4, sec. 20.....	2
Constitution 1870, art. 13, sec. 5.....	4
Legislation for miners' safety.....	
Railroad to coal bank.....	

REVISED STATUTES 1845.
REVISIONS COMPILED AND ANNOTATED.

	Page.
Revised Statutes 1845, p. 27.....Salines.....	359
Revised Statutes 1845, p. 490.....March 3, 1845.....Salines.....	359
	473

CALLAGHAN STATUTES 1913-1916.

STATUTES COMPILED AND ANNOTATED.

	Page.
Callaghan Statutes 1913-1916, p. 499.....Explosives.....	14
Laws 1915, p. 370.....June 25, 1915.	
Callaghan Statutes 1913-1916, pp. 977-1009.....Mining operations.....	212, 229, 235
Laws 1911, p. 389.....June 6, 1911.	
Laws 1913, p. 412.....June 27, 1913.	
Laws 1915, p. 505.....June 28, 1915.	
Callaghan Statutes 1913-1916, p. 1009.....Shot firers.....	377, 378
Laws 1907, p. 401.....May 20, 1907.	
Laws 1913, p. 442.....June 27, 1913.	
Callaghan Statutes 1913-1916, p. 1010-1014.....Examination of miners.....	96, 99
Laws 1913, p. 433.....June 27, 1913.	
Laws 1915, p. 525.....June 29, 1915.	
Callaghan Statutes 1913-1916, pp. 1014-1016.....Mining Investigation Commission..	124
Laws 1913, p. 43.....June 21, 1913.	
Laws 1915, p. 80.....June 29, 1915.	
Callaghan Statutes 1913-1916, pp. 1018-1019.....Explosives.....	17
Laws 1913, p. 431.....June 26, 1913.	
Callaghan Statutes 1913-1916, p. 1021-1022.....Mine fire fighting and rescue stations	31
Laws 1915, p. 527.....June 23, 1915.	
Callaghan Statutes 1913-1916, pp. 1022-1025.....Mine fire fighting equipment.....	44
Laws 1915, p. 522.....June 23, 1915.	
Callaghan Statutes 1913-1916, p. 1025.....Mining lease—Release.....	126
Laws 1913, p. 437.....July 12, 1915.	
Callaghan Statutes 1913-1916, pp. 1067-1069.....Oil.....	353
Laws 1915, p. 531.....June 29, 1915.	
Callaghan Statutes 1913-1916, pp. 1666-1669.....Weighing coal.....	351
Laws 1913, p. 442 (609).....June 27, 1913.	

STATUTES COMPILED AND ANNOTATED.

475

	Page.
Courtright Statutes 1916, p. 1439.....	Miners' wages..... 100
Laws 1897, p. 270.....	June 3, 1897.....
Courtright Statutes 1916, p. 1439.....	Oil..... 357
Laws 1911, p. 426.....	June 7, 1911.....
Courtright Statutes 1916, p. 1440.....	Mine inspectors..... 48
Laws 1891, p. 167.....	June 18, 1891.....
Courtright Statutes 1916, p. 1492-1493.....	Oil..... 352
Laws 1915, pp. 531, 532.....	June 20, 1915.....
Courtright Statutes 1916, p. 1767.....	Taxation..... 383
Laws 1906, p. 353.....	May 18, 1906.....
Courtright Statutes 1916, p. 2179-2180.....	Weighing coal..... 385
Laws 1855, p. 176.....	February 14, 1855.....

HURD'S REVISED STATUTES.

REVISIONS COMPILED AND ANNOTATED.

1874.

	Page.
Revised Statutes 1874, p. 283.....	Burying dead miners..... 1
Revised Statutes 1874, p. 376.....	Mineral lands..... 53
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1874, 352 p. 385.....	March 27, 1874..... Explosives..... 11
Revised Statutes 1874, p. 391.....	Salines..... 359
Revised Statutes 1845, p. 490.	
Revised Statutes 1874, p. 392.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1874, p. 704.....	Mining operations..... 128
Laws 1871-72, p. 506.....	March 27, 1872.
Revised Statutes 1874, p. 705.....	Mining operations..... 133
Laws 1873, p. 110.....	April 24, 1873.
Revised Statutes 1874, p. 709.....	March 24, 1874..... Eminent domain..... 6
Revised Statutes 1874, p. 709.....	March 24, 1874..... Mineral lands—Trespass..... 60
Revised Statutes 1874, p. 709.....	March 24, 1874..... Mining rights—Conveyance..... 343
Revised Statutes 1874, p. 709.....	March 24, 1874..... Minerals..... 57
Revised Statutes 1874, p. 710.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1874, p. 710.....	Minerals..... 53
Laws 1861, p. 140.....	February 25, 1861.
Revised Statutes 1874, p. 731.....	March 12, 1874..... Oil..... 247
Revised Statutes 1874, p. 858.....	Taxation..... 381
Laws 1871-72, p. 1.....	March 30, 1872.
Revised Statutes 1874, p. 1008.....	February 27, 1874..... Weight of coal..... 285

1877.

Revised Statutes 1877, p. 281.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 283.	
Revised Statutes 1877, p. 372.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1877, p. 387.....	Salines..... 35
Revised Statutes 1845, p. 493.	
Revised Statutes 1877, p. 388.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1877, p. 667.....	Mining operations..... 12
Laws 1871-72, p. 506.....	March 27, 1872.
Revised Statutes 1877, p. 668-670.....	Mining operations..... 123
Laws 1877, p. 120.....	May 23, 1877.
Revised Statutes 1877, p. 672.....	Mineral lands..... 60
Laws 1869, p. 126.....	February 18, 1869.
Revised Statutes 1877, p. 672.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1877, p. 672.....	Eminent domain..... 5
Laws 1867, p. 39.....	February 21, 1867. (Extra session.)
Revised Statutes 1877, p. 672.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1877, p. 673.....	Minerals..... 57
Laws 1861, pp. 140-141.....	February 25, 1861.
Revised Statutes 1877, p. 1037.....	Weighing coal..... 285
Laws 1855, p. 176.....	February 14, 1855.

1880.

	Page.
Revised Statutes 1880, p. 276.....Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1880, p. 381.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.....	
Revised Statutes 1880, p. 398.....Salines.....	359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1880, p. 397.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.....	
Revised Statutes 1880, p. 713.....Mineral lands.....	60
Laws 1859, p. 126.....February 18, 1859.....	
Revised Statutes 1880, p. 713.....Mining operations.....	141
Laws 1879, p. 204.....May 23, 1879.....	
Revised Statutes 1880, p. 718.....Eminent domain.....	5
Laws 1867, p. 39.....February 21, 1867.....	
(Extra session.).....	
Revised Statutes 1880, p. 718.....Eminent domain.....	6
Laws 1874, p. 709.....March 24, 1874.....	
Revised Statutes 1880, p. 719.....Mining rights—Conveyance.....	343
Laws 1861, p. 146.....February 20, 1861.....	
Revised Statutes 1880, p. 719.....Minerals.....	57
Laws 1861, p. 140.....February 25, 1861.....	
Revised Statutes 1880, p. 1106.....Weighing coal.....	385
Laws 1855, p. 176.....February 14, 1855.....	

1881.

Revised Statutes 1881, p. 282.....Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1881, p. 391.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.....	
Revised Statutes 1881, p. 407.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.....	
Revised Statutes 1881, p. 734.....Mining operations.....	141
Laws 1879, p. 204.....May 23, 1879.....	
Revised Statutes 1881, p. 739.....Mineral lands.....	60
Laws 1859, p. 126.....February 18, 1859.....	
Revised Statutes 1881, p. 739.....Eminent domain.....	5
Laws 1867, p. 39.....February 21, 1867.....	
(Extra session.).....	
Revised Statutes 1881, p. 739.....Eminent domain.....	9
Laws 1874, p. 709.....March 24, 1874.....	
Revised Statutes 1881, p. 740.....Mining rights—Conveyance.....	343
Laws 1861, p. 146.....February 20, 1861.....	
Revised Statutes 1881, p. 740.....Minerals.....	57
Laws 1861, p. 140-141.....February 25, 1861.....	
Revised Statutes 1881, p. 760.....Oil.....	346
Laws 1869, p. 259.....April 19, 1869.....	
Revised Statutes 1881, p. 760.....Oil.....	346
Laws 1874, (Hurd) p. 731.....March 12, 1874.....	
Revised Statutes 1881, p. 760.....Oil.....	347
Laws 1871-72, p. 566.....April 9, 1872.....	
Revised Statutes 1881, p. 1132.....Weighing coal.....	385
Laws 1855, p. 176.....February 14, 1855.....	
Revised Statutes 1845, p. 532.....	

1883.

Revised Statutes 1883, p. 289.....Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1883, p. 398.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.....	
Revised Statutes 1883, p. 413.....Salines.....	369
Revised Statutes 1845, p. 490.....	
Revised Statutes 1883, p. 414.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.....	
Revised Statutes 1883, p. 755.....Mining operations.....	141
Laws 1879, p. 204.....May 23, 1879.....	

	Page.
Revised Statutes 1883, p. 756.....	150
Laws 1883, p. 114-120.....	June 18, 1883.
Revised Statutes 1883, p. 761.....	396
Laws 1883, p. 113.....	June 14, 1883.
Revised Statutes 1883, p. 763.....	60
Laws 1880, p. 126.....	February 18, 1880.
Revised Statutes 1883, p. 763.....	8
Laws 1867, p. 39.....	February 21, 1867.
(Extra session.)	
Revised Statutes 1883, p. 763.....	8
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1883, p. 764.....	57
Laws 1861, p. 140-141.....	February 25, 1861.
Revised Statutes 1883, p. 764.....	342
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1883, p. 784.....	340
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1883, p. 784.....	346
Laws 1860, p. 259.....	April 19, 1860.
Revised Statutes 1883, p. 784.....	347
Laws 1871-72, p. 566.....	April 9, 1872.
Revised Statutes 1883, p. 1172.....	388
Laws 1855, p. 176.....	February 14, 1855.
	1
1885.	
Revised Statutes 1885, p. 286.....	Burying dead, miners.....
Revised Statutes (Hurd) 1874, p. 283.	
Revised Statutes 1885, p. 400.....	68
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1885, p. 424.....	350
Revised Statutes 1845, p. 400.	Salines.....
Revised Statutes 1885, p. 425.....	58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1885, p. 820.....	141
Laws 1879, p. 204.....	May 28, 1879.
Revised Statutes 1885, p. 821.....	146
Laws 1883, p. 116.....	June 18, 1883.
Revised Statutes 1885, p. 821.....	151
Laws 1885, p. 217.....	June 30, 1885.
Revised Statutes 1885, p. 824.....	151
Laws 1885, p. 217.....	June 30, 1885.
Revised Statutes 1886, p. 826.....	150
Laws 1883, p. 114.....	June 21, 1883.
Revised Statutes 1886, p. 827.....	308
Laws 1883, p. 113.....	June 14, 1883.
Revised Statutes 1886, p. 827.....	308
Laws 1885, p. 221.....	June 29, 1885.
Revised Statutes 1886, p. 828.....	60
Laws 1860, p. 126.....	February 18, 1860.
Revised Statutes 1886, p. 828.....	8
Laws 1867, p. 39.....	February 21, 1867.
(Extra session.)	
Revised Statutes 1886, p. 828.....	6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1886, p. 829.....	343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1886, p. 829.....	57
Laws 1861, p. 140, 141.....	February 25, 1861.
Revised Statutes 1886, p. 840.....	345, 347, 349
Laws 1860, p. 259.....	April 19, 1860.
Laws 1871-72, p. 566.....	April 9, 1872.
Laws 1874, p. 721.....	March 12, 1874.
Revised Statutes 1886, p. 1245.....	385
Laws 1855, p. 176.....	February 14, 1855.
Revised Statutes 1845, p. 532.	

1887.

	Page.
Revised Statutes 1887, p. 329.....	Burying dead, miners..... 1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1887, p. 442.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.....
Revised Statutes 1887, p. 461.....	Mineral lands..... 58
Laws 1888, p. 70.....	February 13, 1883.....
Revised Statutes 1887, p. 478.....	Salines..... 338
Revised Statutes 1845, p. 490.....	
Revised Statutes 1887, p. 479.....	Mineral lands..... 58
Laws 1888, p. 70.....	February 13, 1883.....
Revised Statutes 1887, p. 887.....	Mining operations..... 141
Laws 1879, p. 204.....	May 28, 1879.....
Revised Statutes 1887, p. 888.....	Mining operations..... 150
Laws 1883, p. 114-120.....	June 18, 1883.....
Revised Statutes 1887, p. 889.....	Mining operations..... 155
Laws 1887, p. 231.....	June 16, 1887.....
Revised Statutes 1887, p. 892.....	Mining operations..... 151
Laws 1885, p. 217.....	June 30, 1885.....
Revised Statutes 1887, p. 896.....	Mineral lands..... 60
Laws 1889, p. 126.....	February 18, 1889.....
Revised Statutes 1887, p. 896.....	Eminent domain..... 5
Laws 1887, p. 39.....	February 21, 1867 (extra session).....
Revised Statutes 1887, p. 896.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.....
Revised Statutes 1887, p. 897.....	Mining rights—Conveyances..... 343
Laws 1861, p. 146.....	February 20, 1861.....
Revised Statutes 1887, p. 897.....	Minerals..... 67
Laws 1861, pp. 140-141.....	February 25, 1861.....
Revised Statutes 1887, p. 917.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.....
Revised Statutes 1887, p. 917.....	Oil..... 347
Laws 1871-72, p. 566.....	April 9, 1872.....
Revised Statutes 1887, p. 917.....	Oil..... 346
Laws 1889, p. 250.....	April 19, 1889.....
Revised Statutes 1887, p. 917.....	Oil..... 350
Laws 1887, p. 242.....	June 17, 1887.....
Revised Statutes 1887, p. 1339.....	Weighing coal..... 335
Laws 1855, p. 176.....	February 14, 1855.....

1889.

Revised Statutes 1889, p. 347.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1889, p. 463.....	Explosives..... 13
Laws 1889, p. 152.....	May 28, 1889.....
Revised Statutes 1889, p. 463.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.....
Revised Statutes 1889, p. 481.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.....
Revised Statutes 1889, p. 498.....	Salines..... 338
Revised Statutes 1845, p. 490.....	
Revised Statutes 1889, p. 499.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.....
Revised Statutes 1889, p. 926.....	Mining operations..... 150
Laws 1889, p. 202-7.....	June 4, 1889.....
Revised Statutes 1889, p. 926.....	Mining operations..... 141
Laws 1879, p. 204.....	May 28, 1879.....
Revised Statutes 1889, p. 930.....	Mining operations..... 150
Laws 1883, p. 114-120.....	June 18, 1883.....
Revised Statutes 1889, p. 931.....	Mining operations..... 151
Laws 1885, p. 217.....	June 30, 1885.....
Revised Statutes 1889, p. 933.....	Mining operations..... 153
Laws 1887, p. 231-235.....	June 16, 1887.....
Revised Statutes 1889, p. 984.....	Weighing coal..... 335
Laws 1887, p. 236.....	June 17, 1887.....
Revised Statutes 1889, p. 985.....	Mineral lands..... 60
Laws 1889, p. 126.....	February 18, 1889.....

Page.

Revised Statutes 1889, p. 935.....	Eminent domain.....	5
Laws 1867, p. 39.....	February 21, 1867.....	
Revised Statutes 1889, p. 935.....	Eminent domain.....	6
Laws 1874, p. 700.....	March 24, 1874.....	
Revised Statutes 1889, p. 936.....	Mining rights—Conveyance.....	343
Laws 1861, p. 146.....	February 20, 1861.....	
Revised Statutes 1889, p. 936.....	Minerals.....	57
Laws 1861, p. 140-141.....	February 25, 1861.....	
Revised Statutes 1889, p. 955.....	Oil.....	349
Laws 1874, p. 731.....	March 12, 1874.....	
Revised Statutes 1889, p. 955.....	Oil.....	347
Laws 1871-72, p. 566-567.....	April 9, 1872.....	
Revised Statutes 1889, p. 955.....	Oil.....	346
Laws 1869, p. 250.....	April 19, 1869.....	
Revised Statutes 1889, p. 955.....	Oil.....	350
Laws 1887, p. 242.....	June 17, 1887.....	
Revised Statutes 1889, p. 1394.....	Weighing coal.....	385
Laws 1855, p. 170.....	February 14, 1855.....	
1891.		
Revised Statutes 1891, p. 350.....	Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 263.....		
Revised Statutes 1891, p. 490.....	Oil.....	384
Laws 1887, p. 96.....	June 6, 1887.....	
Revised Statutes 1891, p. 494.....	Mineral lands.....	58
Laws 1863, p. 70.....	February 13, 1863.....	
Revised Statutes 1891, p. 511.....	Salines.....	359
Revised Statutes 1845, p. 490.....		
Revised Statutes 1891, p. 512.....	Mineral lands.....	58
Laws 1863, p. 70.....	February 13, 1863.....	
Revised Statutes 1891, p. 952.....	Mining operations.....	141
Laws 1879, p. 204.....	May 28, 1879.....	
Revised Statutes 1891, p. 952.....	Mining operations.....	149
Laws 1880, p. 202.....	June 4, 1880.....	
Revised Statutes 1891, p. 957.....	Mining operations.....	151
Laws 1885, p. 217.....	June 30, 1885.....	
Revised Statutes 1891, p. 959.....	Mining operations.....	150
Laws 1883, p. 114.....	June 21, 1883.....	
Revised Statutes 1891, p. 960.....	Mining operations.....	155
Laws 1887, p. 231.....	June 16, 1887.....	
Revised Statutes 1891, p. 960.....	Weighing coal.....	389
Laws 1887, p. 235.....	June 17, 1887.....	
Revised Statutes 1891, p. 961.....	Weighing coal.....	391
Laws 1891, p. 170.....	June 10, 1891.....	
Revised Statutes 1891, p. 961.....	Mine managers.....	54
Laws 1891, p. 168.....	June 18, 1891.....	
Revised Statutes 1891, p. 962.....	Mine inspectors.....	48
Laws 1891, p. 167.....	June 18, 1891.....	
Revised Statutes 1891, p. 963.....	Mineral lands.....	60
Laws 1859, p. 126.....	February 18, 1859.....	
Revised Statutes 1891, p. 963.....	Emipent domain.....	5
Laws 1867, p. 39.....	February 21, 1869.....	
Revised Statutes 1891, p. 963.....	Eminent domain.....	6
Laws 1874, p. 709.....	March 24, 1874.....	
Revised Statutes 1891, p. 964.....	Minerals.....	57
Laws 1861, p. 140, 141.....	February 25, 1861.....	
Revised Statutes 1891, p. 964.....	Mining rights, Conveyance.....	343
Laws 1861, p. 146.....	February 20, 1861.....	
Revised Statutes 1891, p. 963.....	Oil.....	349
Laws 1874, p. 731.....	March 12, 1874.....	
Revised Statutes 1891, p. 963.....	Oil.....	350
Laws 1887, p. 242.....	June 17, 1887.....	
Revised Statutes 1891, p. 964.....	Oil.....	346, 347
Laws 1869, p. 250.....	April 19, 1869.....	
Laws 1871-72, p. 566.....	April 9, 1872.....	
Revised Statutes 1891, p. 1438.....	Weighing coal.....	385
Laws 1891, p. 214.....	June 18, 1891.....	

1893.

	Page.
Revised Statutes 1893, p. 363.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1893, p. 476.....	11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1893, p. 479.....	13
Laws 1889, p. 152.....	May 28, 1889.
Revised Statutes 1893, p. 498.....	58
Laws 1883, p. 70.....	February 12, 1883.
Revised Statutes 1893, p. 516.....	369
Revised Statutes 1845, p. 490.....	
Revised Statutes 1893, p. 516.....	56
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1893, p. 516.....	120
Laws 1891, p. 206.....	June 11, 1891.
Revised Statutes 1893, p. 574.....	141
Laws 1879, p. 204.....	May 28, 1879.
Revised Statutes 1893, p. 574.....	139
Laws 1889, p. 202-207.....	June 4, 1889.
Revised Statutes 1893, p. 978.....	150
Laws 1883, p. 114-120.....	June 18, 1883.
Revised Statutes 1893, p. 979.....	151
Laws 1885, p. 217.....	June 30, 1885.
Revised Statutes 1893, p. 981.....	155
Laws 1887, p. 231.....	June 16, 1887.
Revised Statutes 1893, p. 982.....	389
Laws 1887, p. 235.....	June 17, 1887.
Revised Statutes 1893, p. 982.....	391
Laws 1891, p. 170.....	June 15, 1891.
Revised Statutes 1893, p. 983.....	391
Laws 1891, p. 170.....	June 10, 1891.
Revised Statutes 1893, p. 993.....	54
Laws 1891, p. 168.....	June 18, 1891.
Revised Statutes 1893, p. 994.....	46
Laws 1891, p. 167.....	June 18, 1891.
Revised Statutes 1893, p. 1006.....	349
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1893, p. 1006.....	347
Laws 1871-72, p. 566.....	April 9, 1872.
Revised Statutes 1893, p. 1006.....	346
Laws 1890, p. 259.....	April 19, 1890.
Revised Statutes 1893, p. 1006.....	380
Laws 1887, p. 242.....	June 17, 1887.
Revised Statutes 1893, p. 1474.....	385
Laws 1855, p. 176.....	February 14, 1876.

1895.

Revised Statutes 1895, p. 398.....	2
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1895, p. 520.....	11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1895, p. 521.....	13
Laws 1889, p. 152.....	May 28, 1889.
Revised Statutes 1895, p. 541.....	58
Laws 1863, p. 70.....	February 12, 1863.
Revised Statutes 1895, p. 559.....	56
Laws 1863, p. 70.....	February 12, 1863.
Revised Statutes 1895, p. 559.....	120
Laws 1891, p. 206.....	June 11, 1891.
Revised Statutes 1895, p. 1087.....	141
Laws 1879, p. 204 (101).....	May 28, 1879.
Revised Statutes 1895, p. 1088.....	139
Laws 1889, p. 202-207.....	June 4, 1889.
Revised Statutes 1895, p. 1040.....	86
Laws 1890, p. 250.....	June 21, 1890.
Revised Statutes 1895, p. 1042.....	150
Laws 1893, p. 114-120.....	June 18, 1893.

	Page.
Revised Statutes 1895, p. 1048.....Mining operations.....	188
Laws 1895, p. 252.....June 15, 1895.....	
Revised Statutes 1895, p. 1048.....Mining operations.....	188
Laws 1887, p. 251.....June 16, 1887.....	
Revised Statutes 1895, p. 1048.....Weighing coal.....	201
Laws 1891, p. 170.....June 16, 1891.....	
Revised Statutes 1895, p. 1048.....Weighing coal.....	200
Laws 1887, p. 255.....June 17, 1887.....	
Revised Statutes 1895, p. 1047.....Mine managers.....	54
Laws 1891, p. 168.....June 18, 1891.....	
Revised Statutes 1895, p. 1048.....Mine managers.....	55
Laws 1895, p. 255.....June 21, 1895.....	
Revised Statutes 1895, p. 1049.....Oil.....	254
Laws 1895, p. 256.....April 30, 1895.....	
Revised Statutes 1895, p. 1049.....Mine inspectors.....	48
Laws 1891, p. 167.....June 18, 1891.....	
Revised Statutes 1895, p. 1050.....Mine inspectors.....	46
Laws 1895, p. 255.....June 4, 1895.....	
Revised Statutes 1895, p. 1050.....Examination of miners.....	56
Laws 1895, p. 250.....June 21, 1895.....	
Revised Statutes 1895, p. 1051.....Miners' Home.....	105
Laws 1895, p. 242.....June 21, 1895.....	
Revised Statutes 1895, p. 1052.....Mineral lands.....	60
Laws 1889, p. 126.....February 18, 1889.....	
Revised Statutes 1895, p. 1053.....Eminent domain.....	5
Laws 1887, p. 30.....February 21, 1887. (Extra session.).....	
Revised Statutes 1895, p. 1053.....Eminent domain.....	6
Laws 1874, p. 709.....March 24, 1874.....	
Revised Statutes 1895, p. 1053.....Mining rights—Conveyance.....	343
Laws 1891, p. 146.....February 20, 1891.....	
Revised Statutes 1895, p. 1053.....Minerals.....	57
Laws 1891, p. 140-141.....February 25, 1891.....	
Revised Statutes 1895, p. 1074.....Oil.....	249
Laws 1874, p. 731.....March 12, 1874.....	
Revised Statutes 1895, p. 1074.....Oil.....	247
Laws 1871-72, pp. 566-568.....April 9, 1872.....	
Revised Statutes 1895, p. 1074.....Oil.....	240
Laws 1887, p. 242.....June 17, 1887.....	
Revised Statutes 1895, p. 1263.....Taxation.....	202
Laws 1893, p. 172.....June 19, 1893.....	
Revised Statutes 1895, p. 1576.....Weighing coal.....	205
Laws 1855, p. 176.....February 14, 1855.....	
1897.	
Revised Statutes 1897, p. 418.....Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1897, p. 556.....Explosives.....	11
Laws 1887, p. 180.....June 16, 1887.....	
Revised Statutes 1897, p. 557.....Explosives.....	13
Laws 1890, p. 152.....May 28, 1890.....	
Revised Statutes 1897, p. 578.....Mineral lands.....	53
Laws 1893, p. 70.....February 13, 1893.....	
Revised Statutes 1897, p. 595.....Salines.....	250
Revised Statutes 1845, p. 490.....	
Revised Statutes 1897, p. 596.....Mineral lands.....	58
Laws 1893, p. 70.....February 13, 1893.....	
Revised Statutes 1897, p. 596.....Mining corporations.....	120
Laws 1891, p. 206.....June 11, 1891.....	
Revised Statutes 1897, p. 597.....Mining corporations.....	120
Laws 1897, p. 208.....June 10, 1897.....	
Revised Statutes 1897, p. 1083.....Mining operations.....	141
Laws 1879, p. 204 (191).....May 28, 1879.....	
Revised Statutes 1897, p. 1094.....Mining operations.....	180
Laws 1890, p. 203-207.....June 4, 1890.....	
Revised Statutes 1897, p. 1095.....Mining operations.....	56
Laws 1895, p. 208.....June 21, 1895.....	

	Page.
Revised Statutes 1897, p. 1057.....	Mining operations..... 159
Laws 1898, p. 202.....	June 4, 1898.....
Revised Statutes 1897, p. 1058.....	Mining operations..... 159
Laws 1893, pp. 114-120.....	June 13, 1893.....
Revised Statutes 1897, p. 1059.....	Mining operations..... 160
Laws 1897, p. 209.....	June 7, 1897.....
Revised Statutes 1897, p. 1059.....	Mining operations..... 162
Laws 1895, p. 252.....	June 15, 1895.....
Revised Statutes 1897, p. 1059.....	Mining operations..... 155
Laws 1887, p. 231.....	June 16, 1887.....
Revised Statutes 1897, p. 1058.....	Weighing coal..... 391
Laws 1891, p. 170.....	June 16, 1891.....
Revised Statutes 1897, p. 1052.....	Weighing coal..... 399
Laws 1887, p. 235.....	June 17, 1887.....
Revised Statutes 1897, p. 1053.....	Mine managers..... 54
Laws 1891, p. 168.....	June 18, 1891.....
Revised Statutes 1897, p. 1054.....	Mine managers..... 55
Laws 1895, p. 255.....	June 21, 1895.....
Revised Statutes 1897, p. 1055.....	Oil..... 354
Laws 1895, p. 255.....	April 20, 1895.....
Revised Statutes 1897, p. 1055.....	Mine inspectors..... 65
Laws 1891, p. 167.....	June 18, 1891.....
Revised Statutes 1897, p. 1056.....	Mine inspectors..... 65
Laws 1895, p. 255.....	June 4, 1895.....
Revised Statutes 1897, p. 1056.....	Fire bosses and hoisting engineers.. 58
Laws 1895, p. 250.....	June 21, 1895.....
Revised Statutes 1897, p. 1057.....	Miners' liens..... 105
Laws 1895, p. 242.....	June 21, 1895.....
Revised Statutes 1897, p. 1058.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.....
Revised Statutes 1897, p. 1058.....	Miners' wages..... 109
Laws 1897, p. 270.....	June 3, 1897.....
Revised Statutes 1897, p. 1058.....	Examination of miners..... 93
Laws 1897, p. 268.....	June 7, 1897.....
Revised Statutes 1897, p. 1059.....	Mineral lands..... 90
Laws 1899, p. 126.....	February 18, 1899.....
Revised Statutes 1897, p. 1059.....	Mining rights—Conveyance..... 343
Laws 1891, p. 146.....	February 20, 1891.....
Revised Statutes 1897, p. 1059.....	Eminent domain..... 5
Laws 1897, p. 39.....	February 21, 1897.....
Revised Statutes 1897, p. 1059.....	Minerals..... 87
Laws 1891, p. 140-141.....	February 25 1891.....
Revised Statutes 1897, p. 1120.....	Oil..... 342
Laws 1874, p. 731.....	March 12, 1874.....
Revised Statutes 1897, p. 1120.....	Oil..... 357
Laws 1887, p. 242.....	June 17, 1887.....
Revised Statutes 1897, p. 1121.....	Oil..... 347
Laws 1871-72, pp. 556-567.....	April 9, 1872.....
Revised Statutes 1897, p. 1121.....	Oil..... 346
Laws 1899, p. 239.....	April 19, 1899.....
Revised Statutes 1897, p. 1314.....	Taxation..... 352
Laws 1893, p. 172.....	June 19, 1893.....
Revised Statutes 1897, p. 1635.....	Weighing coal..... 385
Laws 1855, p. 176.....	February 14, 1855.....

1898.

Revised Statutes, 1898, p. 418.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes, 1898, p. 553.....	Explosives..... 13
Laws 1889, p. 152.....	May 23, 1889.....
Revised Statutes, 1898, p. 555.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.....
Revised Statutes, 1898, p. 595.....	Salines..... 359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1898, p. 595.....	Mineral lands..... 52
Laws 1893, p. 70.....	February 12, 1893.....

	Page.
Revised Statutes 1898, p. 596.....	Mining corporations..... 120
Laws 1897, p. 298..... June 10, 1898.	
Revised Statutes 1898, p. 1063.....	Mining operations..... 141
Laws 1879, p. 204 (101)..... May 26, 1879.	
Revised Statutes, 1898, p. 1084.....	Mining operations..... 159
Laws 1899, pp. 202-207..... June 4, 1899.	
Revised Statutes 1898, p. 1086.....	Mining operations..... 56
Laws 1896, p. 280 (348)..... June 21, 1896.	
Revised Statutes 1898, p. 1088.....	Mining operations..... 146
Laws 1883, pp. 116-118..... June 18, 1883.	
Revised Statutes 1898, p. 1089.....	Mining operations..... 166
Laws 1897, p. 269..... June 7, 1897.	
Revised Statutes 1898, p. 1089.....	Mining operations..... 163
Laws 1896, p. 262..... June 15, 1896.	
Revised Statutes 1895, p. 1092.....	Weighing coal..... 391
Laws 1891, p. 170..... June 16, 1891.	
Revised Statutes 1898, p. 1091.....	Mining operations..... 155
Laws 1887, p. 231 (235)..... June 16, 1887.	
Revised Statutes 1898, p. 1092.....	Weighing coal..... 391
Laws 1887, p. 235..... June 17, 1887.	
Revised Statutes 1898, p. 1093.....	Weighing coal..... 391
Laws 1891, p. 170..... June 10, 1891.	
Revised Statutes 1898, p. 1093.....	Mine managers..... 54
Laws 1891, p. 168..... June 18, 1891.	
Revised Statutes 1898, p. 1094.....	Mine managers..... 55
Laws 1896, p. 255..... June 21, 1896.	
Revised Statutes 1898, p. 1095.....	Mine inspectors..... 48
Laws 1891, p. 167..... June 18, 1891.	
Revised Statutes 1898, p. 1095.....	Oil..... 354
Laws 1895, p. 256..... April 30, 1895.	
Revised Statutes 1898, p. 1096.....	Mine inspectors..... 48
Laws 1895, p. 255..... June 4, 1895.	
Revised Statutes 1898, p. 1096.....	Fire bosses and hoisting engineers.. 56
Laws 1896, p. 250..... June 21, 1896.	
Revised Statutes, 1898, p. 1097.....	Miners' liens..... 165
Laws 1895, p. 242..... June 21, 1895.	
Revised Statutes 1898, p. 1098.....	Eminent domain..... 6
Laws 1874, p. 709..... March 24, 1874.	
Revised Statutes 1898, p. 1098.....	Miners' wages..... 109
Laws 1897, p. 270..... June 3, 1897.	
Revised Statutes 1898, p. 1098.....	Examination of miners..... 92
Laws 1897, p. 268..... June 7, 1897.	
Revised Statutes 1898, p. 1099.....	Mineral lands..... 60
Laws 1859, p. 126..... February 18, 1859.	
Revised Statutes 1898, p. 1099.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146..... February 20, 1861.	
Revised Statutes 1898, p. 1099.....	Eminent domain..... 5
Laws 1867, p. 39..... February 21, 1867. (Extra session.)	
Revised Statutes 1898, p. 1099.....	Minerals..... 57
Laws 1861, pp. 140-141..... February 25, 1861.	
Revised Statutes 1898, p. 1120.....	Oil..... 349
Laws 1874, p. 731..... March 12, 1874.	
Revised Statutes 1898, p. 1120.....	Oil..... 350
Laws 1887, p. 242..... June 17, 1887.	
Revised Statutes 1898, p. 1121.....	Oil..... 347
Laws 1871-72, p. 566..... April 9, 1872.	
Revised Statutes 1898, p. 1121.....	Oil..... 346
Laws 1899, p. 259..... April 19, 1899.	
Revised Statutes 1898, p. 1315.....	Taxation..... 382
Laws 1898, p. 172..... June 19, 1898.	
Revised Statutes 1898, p. 1634.....	Weighing coal..... 385
Laws 1855, p. 176..... February 14, 1855.	
Revised Statutes 1898, p. 1634.....	Weight of coal..... 386
Laws 1874, p. 1098..... February 27, 1874.	

1899.

	Page.
Revised Statutes 1899, p. 630.....	1
Revised Statutes (Hurd) 1874, p. 263.....	
Revised Statutes 1899, p. 575.....	11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1899, p. 597.....	58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1899, p. 614.....	359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1899, p. 615.....	58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1899, p. 615.....	120
Laws 1897, p. 298.....	June 10, 1897.
Revised Statutes 1899, p. 1157.....	187
Laws 1899, p. 301.....	April 18, 1899.
Revised Statutes 1899, p. 1176.....	60
Laws 1859, p. 126.....	February 18, 1859.
Revised Statutes 1899, p. 1176.....	5
Laws 1867, p. 39.....	February 21, 1867.
(Extra session.)	
Revised Statutes 1899, p. 1176.....	6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1899, p. 1177.....	243
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1899, p. 1177.....	57
Laws 1861, p. 140-141.....	February 26, 1861.
Revised Statutes 1899, p. 1197.....	349
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1899, p. 1197.....	250
Laws 1887, p. 242.....	June 17, 1887.
Revised Statutes 1899, p. 1198.....	347
Laws 1871-72, p. 566.....	April 9, 1872.
Revised Statutes 1899, p. 1198.....	346
Laws 1899, p. 269.....	April 19, 1899.
Revised Statutes 1899, p. 1394.....	282
Laws 1893, p. 172.....	June 19, 1893.
Revised Statutes 1899, p. 1744.....	385
Laws 1855, p. 176.....	February 14, 1855.

1901.

Revised Statutes 1901, p. 449.....	1
Revised Statutes (Hurd) 1874, p. 263.....	
Revised Statutes 1901, p. 599.....	11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1901, p. 620.....	58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1901, p. 638.....	359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1901, p. 639.....	5
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1901, p. 639.....	120
Laws 1897, p. 298.....	June 10, 1897.
Revised Statutes 1901, p. 639.....	120
Laws 1891, p. 366.....	June 11, 1891.
Revised Statutes 1901, p. 1202.....	187
Laws 1899, p. 301.....	April 18, 1899.
Revised Statutes 1901, p. 1221.....	354
Laws 1895, p. 266.....	April 30, 1895.
Revised Statutes 1901, p. 1221.....	355
Laws 1901, p. 247.....	May 11, 1901.
Revised Statutes 1901, p. 1222.....	60
Laws 1899, p. 126.....	February 18, 1899.
Revised Statutes 1901, p. 1222.....	343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1901, p. 1222.....	5
Laws 1867, p. 39.....	February 21, 1867. (Extra session.)

	Page.
Revised Statutes 1901, p. 1222.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1901, p. 1223.....	Minerals..... 57
Laws 1861, p. 140-141.....	February 26, 1861.
Revised Statutes 1901, p. 1243.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1901, p. 1243.....	Oil..... 347
Laws 1871-72, p. 566-568.....	April 9, 1872.
Revised Statutes 1901, p. 1243.....	Oil..... 346
Laws 1869, p. 239.....	April 19, 1869.
Revised Statutes 1901, p. 1243.....	Oil..... 350
Laws 1887, p. 242.....	June 17, 1887.
Revised Statutes 1901, p. 1444.....	Taxation..... 382
Laws 1893, p. 172.....	June 19, 1893.
Revised Statutes 1901, p. 1815.....	Weighing coal..... 385
Laws 1855, p. 176.....	February 14, 1855.
1903.	
Revised Statutes 1903, p. 468.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 263.	
Revised Statutes 1903, p. 520.....	Mining corporations..... 120
Laws 1897, p. 208.....	June 10, 1897.
Revised Statutes 1903, p. 628.....	Explosives..... 13
Laws 1903, p. 159.....	May 3, 1903.
Revised Statutes 1903, p. 628.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1903 p. 646.....	Mineral lands..... 86
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1903, p. 664.....	Salines..... 359
Revised Statutes 1845, p. 490.	
Revised Statutes 1903, p. 665.....	Mining corporations..... 120
Laws 1891, p. 206.....	June 11, 1891.
Revised Statutes 1903, p. 1248.....	Mining operations..... 187
Laws 1890, p. 301.....	April 18, 1890.
Revised Statutes 1903, p. 1252.....	Miners' examining board..... 65
Laws 1903, p. 250.....	May 14, 1903.
Revised Statutes 1903 p. 1261.....	Mining operations..... 203
Laws 1903 p. 250.....	May 13, 1903.
Revised Statutes 1903, p. 1267.....	Oil..... 354
Laws 1895, p. 255.....	April 30, 1895.
Revised Statutes 1903, p. 1267.....	Miners' washrooms..... 111
Laws 1903, p. 252.....	May 14, 1903.
Revised Statutes 1903, p. 1268.....	Explosives..... 15
Laws 1903, p. 252.....	May 14, 1903.
Revised Statutes 1903, p. 1268.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1903, p. 1268.....	Mineral lands..... 60
Laws 1859, p. 126.....	February 18, 1859.
Revised Statutes 1903, p. 1268.....	Eminent domain..... 5
Laws 1867, p. 39.....	February 21, 1867. (Extra session.)
Revised Statutes 1903, p. 1269.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1903, p. 1269.....	Minerals..... 57
Laws 1861, p. 140-141.....	February 26, 1861.
Revised Statutes 1903, p. 1290.....	Oil..... 347
Laws 1871-72, p. 566-568.....	April 9, 1872.
Revised Statutes 1903, p. 1290.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1903, p. 1290.....	Oil..... 346
Laws 1869, p. 239.....	April 19, 1869.
Revised Statutes 1903, p. 1290.....	Oil..... 350
Laws 1887, p. 242.....	June 17, 1887.
Revised Statutes 1903, p. 1509.....	Taxation..... 382
Laws 1893, p. 172.....	June 19, 1893.
Revised Statutes 1903, p. 1902.....	Weighing coal..... 385
Laws 1855, p. 176.....	February 14, 1855.

1905.

	Page.
Revised Statutes 1905, p. 493.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 263.....	
Revised Statutes 1905, p. 663.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.....
Revised Statutes 1905, p. 684.....	Explosives..... 13
Laws 1903, p. 159.....	May 14, (15), 1903.....
Revised Statutes 1905, p. 704.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.....
Revised Statutes 1905, p. 724.....	Salines..... 359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1905, p. 725.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.....
Revised Statutes 1905, p. 725.....	Mining corporations..... 120
Laws 1897, p. 268.....	June 10, 1897.....
Revised Statutes 1905, p. 1376.....	Mining operations..... 187
Laws 1899, p. 301.....	April 18, 1899.....
Revised Statutes 1905, p. 1390.....	Miners' examining board..... 65
Laws 1903, p. 250.....	May 4, 1903.....
Revised Statutes 1905, p. 1381.....	Mining operations..... 66, 203
Laws 1905, p. 325.....	May 12, 1905.....
Revised Statutes 1905, p. 1383.....	Mining operations..... 204
Laws 1905, p. 325.....	May 13, 1905.....
Revised Statutes 1905, p. 1383.....	Miners' examining board..... 51
Laws 1905, p. 330.....	May 16, 1905.....
Revised Statutes 1905, p. 1389.....	Mining operations—Trappers..... 208
Laws 1903, p. 250.....	May 13, 1903.....
Revised Statutes, 1905, p. 1395.....	Eminent domain..... 5
Laws 1867, p. 39.....	February 21, 1867.....
(Extra session.)	
Revised Statutes 1905, p. 1395.....	Oil..... 354
Laws 1895, p. 256.....	April 30, 1895.....
Revised Statutes 1905, p. 1395.....	Oil..... 355
Laws 1901, p. 247.....	May 11, 1901.....
Revised Statutes 1905, p. 1395.....	Miners' washrooms..... 111
Laws 1903, p. 252.....	May 14, 1903.....
Revised Statutes 1905, p. 1398.....	Mineral lands..... 60
Laws 1859, p. 126.....	February 18, 1859.....
Revised Statutes 1905, p. 1398.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.....
Revised Statutes 1905, p. 1399.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.....
Revised Statutes 1905, p. 1399.....	Minerals..... 57
Laws 1861, p. 140-141.....	February 25, 1861.....
Revised Statutes 1905, p. 1420.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.....
Revised Statutes 1905, p. 1421.....	Oil..... 347
Law 1871-72, p. 506.....	April 9, 1872.....
Revised Statutes 1905, p. 1421.....	Oil..... 346
Laws 1899, p. 259.....	April 19, 1899.....
Revised Statutes 1905, p. 1421.....	Oil..... 350
Laws 1887, p. 242.....	June 17, 1887.....
Revised Statutes 1905, p. 1642.....	Taxation..... 352
Laws 1893, p. 172.....	June 19, 1893.....
Revised Statutes 1905, p. 2048.....	Weighing coal..... 385
Laws 1855, p. 176.....	February 14, 1855.....

1906.

Revised Statutes, 1906, p. 493.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 263.....	
Revised Statutes 1906, p. 663.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.....
Revised Statutes 1906, p. 704.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.....
Revised Statutes 1906, p. 724.....	Salines..... 359
Revised Statutes 1845, p. 490.....	

	Page.
Revised Statutes 1906, p. 725.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1906, p. 725.....	Mining corporations..... 120
Laws 1897, p. 298.....	June 10, 1897.
Revised Statutes 1906, p. 1376.....	Mining operations..... 187
Laws 1899, p. 301.....	April 18, 1899.
Revised Statutes 1906, p. 1380.....	Miners' examining board..... 65
Laws 1903, p. 250.....	May 14, 1903.
Revised Statutes 1906, p. 1381.....	Mining operations..... 203
Laws 1905, p. 325.....	May 12, 1905.
Revised Statutes 1906, p. 1383.....	Mining operations..... 204
Laws 1905, p. 325.....	May 13, 1905.
Revised Statutes 1906, p. 1383.....	Miners' examining board..... 51
Laws 1905, p. 330.....	May 16, 1905.
Revised Statutes 1906, p. 1390.....	Mining operations..... 205
Laws 1905, p. 326.....	May 13, 1905.
Revised Statutes 1906, p. 1391.....	Mining operations..... 204
Laws 1905, p. 329.....	May 13, 1905.
Revised Statutes 1906, p. 1395.....	Oil..... 354
Laws 1895, p. 256.....	April 30, 1895.
Revised Statutes 1906, p. 1395.....	Oil..... 355
Laws 1901, p. 247.....	May 11, 1901.
Revised Statutes 1906, p. 1395.....	Miners' washrooms..... 111
Laws 1903, p. 252.....	May 14, 1903.
Revised Statutes 1906, p. 1396.....	Explosives..... 15
Laws 1903, p. 252.....	May 14, 1903.
Revised Statutes 1906, p. 1396.....	Shot firers..... 376
Laws 1905, p. 328.....	May 18, 1905.
Revised Statutes 1906, p. 1397.....	Oil..... 356
Laws 1905, p. 326.....	May 16, 1905.
Revised Statutes 1906, p. 1398.....	Mineral lands..... 60
Laws 1850, p. 126.....	February 18, 1850.
Revised Statutes 1906, p. 1398.....	Eminent domain..... 5
Laws 1867, p. 39.....	February 21, 1867. (Extra session.)
Revised Statutes 1906, p. 1398.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1906, p. 1399.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1906, p. 1399.....	Minerals..... 57
Laws 1861, p. 140-141.....	February 25, 1861.
Revised Statutes 1906, p. 1420.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1906, p. 1420.....	Oil..... 350
Laws 1887, p. 242.....	June 17, 1887.
Revised Statutes 1906, p. 1421.....	Oil..... 346
Laws 1899, p. 250.....	April 19, 1899.
Revised Statutes 1906, p. 1421.....	Oil..... 347
Laws 1871-72, p. 566.....	April 9, 1872.
Revised Statutes 1906, p. 1642.....	Taxation..... 382
Laws 1893, p. 172.....	June 19, 1893.
Revised Statutes 1906, p. 2048.....	Weighing coal..... 335
Revised Statutes 1845, p. 532.....	February 14, 1855.
Laws 1855, p. 176.....	
1908.	
Revised Statutes 1908, p. 520.....	Burying dead miners..... 1
Revised Statutes (Hurd) 1874, p. 233.....	
Revised Statutes 1908, p. 722.....	Explosives..... 13
Laws 1903, p. 159.....	May 15, 1903.
Revised Statutes 1908, p. 722.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1908, p. 744.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1908, p. 764.....	Salines..... 359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1908, p. 765.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.

	Page.
Revised Statutes 1908, p. 765.....	120
Laws 1897, p. 298.....	June 10, 1897.
Revised Statutes 1908, p. 765.....	Mining corporations..... 120
Laws 1891, p. 206.....	June 11, 1891.
Revised Statutes 1908, p. 767.....	Mining corporations..... 120
Laws 1893, p. 89.....	June 20, 1893.
Revised Statutes 1908, p. 1345.....	Mining leases—Release..... 126
Laws 1907, p. 400.....	May 27, 1907.
Revised Statutes 1908, p. 1424.....	Mining operations..... 187
Laws 1899, p. 301.....	April 18, 1899.
Revised Statutes 1908, p. 1425.....	Mining operations..... 207
Laws 1907, p. 394.....	May 25, 1907.
Revised Statutes 1908, p. 1429.....	Miners' examining board..... 67
Laws 1907, p. 387.....	May 27, 1907.
Revised Statutes 1908, p. 1431.....	Mining operations..... 204
Laws 1906, p. 325.....	May 13, 1906.
Revised Statutes 1908, p. 1431.....	Miners' examining board..... 51
Laws 1906, p. 330.....	May 16, 1906.
Revised Statutes 1908, p. 1431.....	Mining operations..... 205
Laws 1907, p. 387.....	May 27, 1907.
Revised Statutes 1908, p. 1438.....	Mining operations..... 205
Laws 1906, p. 326.....	May 13, 1906.
Revised Statutes 1908, p. 1438.....	Mining operations..... 210
Laws 1907, p. 398.....	May 18, 1907.
Revised Statutes 1908, p. 1438.....	Mining operations..... 209
Laws 1907, p. 397.....	May 25, 1907.
Revised Statutes 1908, p. 1439.....	Mining operations..... 204
Laws 1906, p. 329.....	May 13, 1906.
Revised Statutes 1908, p. 1442.....	Mining operations..... 208
Laws 1907, p. 396.....	May 17, 1907.
Revised Statutes 1908, p. 1443.....	Oil..... 354
Laws 1896, p. 256.....	April 30, 1896.
Revised Statutes 1908, p. 1443.....	Oil..... 355
Laws 1901, p. 247.....	May 11, 1901.
Revised Statutes 1908, p. 1444.....	Explosives..... 15
Laws 1908, p. 252.....	May 14, 1908.
Revised Statutes 1908, p. 1444.....	Shot firers..... 376
Laws 1906, p. 328.....	May 18, 1906.
Revised Statutes 1908, p. 1444.....	Shot firers..... 377
Laws 1907, p. 401.....	May 20, 1907.
Revised Statutes 1908, p. 1445.....	Oil..... 356
Laws 1906, p. 326.....	May 16, 1906.
Revised Statutes 1908, p. 1446.....	Examination of miners..... 92
Laws 1907-8, p. 90.....	June 1, 1908. (Adjourned session.)
Revised Statutes 1908, p. 1449.....	Mineral lands..... 60
Laws 1899, p. 126.....	February 18, 1899.
Revised Statutes 1908, p. 1449.....	Eminent domain..... 5
Laws 1897, p. 39.....	February 21, 1897. (Extra session.)
Revised Statutes 1908, p. 1449.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1908, p. 1450.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1908, p. 1450.....	Minerals..... 57
Laws 1861, p. 140-141.....	February 25, 1861.
Revised Statutes 1908, p. 1496.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.
Revised Statutes 1908, p. 1496.....	Oil..... 347
Laws 1871-72, p. 586-588.....	April 9, 1872.
Revised Statutes 1908, p. 1496.....	Oil..... 346
Laws 1899, p. 269.....	April 19, 1899.
Revised Statutes 1908, p. 1496.....	Oil..... 350
Laws 1897, p. 242.....	June 17, 1897.
Revised Statutes 1908, p. 1749.....	Taxation..... 382
Laws 1893, p. 172.....	June 19, 1893.
Revised Statutes 1908, p. 2188.....	Weighing coal..... 385
Laws 1856, p. 176.....	February 14, 1856.

1911.

	Page.
Revised Statutes 1911, p. 555.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Revised Statutes 1911, p. 767.....	13
Laws 1908, p. 159.....	May 14, 1908.
Revised Statutes 1911, p. 767.....	11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1911, p. 790.....	58
Laws 1883, p. 70.....	February 13, 1883.
Revised Statutes 1911, p. 810.....	359
Revised Statutes 1845, p. 490.....	
Revised Statutes 1911, p. 811.....	58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1911, p. 811.....	120
Laws 1897, p. 208.....	June 10, 1897.
Revised Statutes 1911, p. 811.....	120
Laws 1891, p. 206.....	June 11, 1891.
Revised Statutes 1911, p. 1459.....	125
Laws 1907, p. 400.....	May 27, 1907.
Revised Statutes 1911, p. 1541.....	212
Laws 1911, p. 338.....	June 6, 1911.
Revised Statutes 1911, p. 1564.....	376
Laws 1905, p. 323.....	May 18, 1905.
Revised Statutes 1911, p. 1564.....	377
Laws 1907, p. 401.....	May 20, 1907.
Revised Statutes 1911, p. 1565.....	356
Laws 1905, p. 323.....	May 16, 1905.
Revised Statutes 1911, p. 1565.....	357
Laws 1911, p. 426.....	June 7, 1911.
Revised Statutes 1911, p. 1566.....	92
Laws 1908, p. 90.....	June 1, 1908. (Adjourned session.)
Revised Statutes 1911, p. 1566.....	94
Laws 1909, p. 284.....	June 5, 1909.
Revised Statutes 1911, p. 1569.....	33
Laws 1910, p. 84.....	March 8, 1910.
Revised Statutes 1911, p. 1570.....	38
Laws 1911, p. 419.....	June 7, 1911.
Revised Statutes 1911, p. 1573.....	28
Laws 1910, p. 2.....	March 4, 1910.
Revised Statutes 1911, p. 1573.....	28
Laws 1911, p. 424.....	June 5, 1911.
Revised Statutes 1911, p. 1574.....	16
Laws 1911, p. 335.....	June 7, 1911.
Revised Statutes 1911, p. 1576.....	60
Laws 1859, p. 126.....	February 18, 1859.
Revised Statutes 1911, p. 1576.....	5
Laws 1897, p. 30.....	February 21, 1897. (Extra session.)
Revised Statutes 1911, p. 1576.....	6
Laws 1874, p. 769.....	March 24, 1874.
Revised Statutes 1911, p. 1576.....	105
Laws 1896, p. 242.....	June 21, 1905.
Revised Statutes 1911, p. 1577.....	342
Laws 1861, p. 145.....	February 20, 1861.
Revised Statutes 1911, p. 1577.....	57
Laws 1861, pp. 140-141.....	February 25, 1861.
Revised Statutes 1911, p. 1625.....	349
Laws 1874, p. 721.....	March 12, 1874.
Revised Statutes 1911, p. 1625.....	351
Laws 1911, p. 422.....	May 29, 1911.
Revised Statutes 1911, p. 1626.....	347
Laws 1871-72, p. 566.....	April 9, 1872.
Revised Statutes 1911, p. 1626.....	346
Laws 1899, p. 259.....	April 19, 1899.

	Page.
Revised Statutes 1911, p. 1907.....	Taxation..... 382
Laws 1893, p. 172.....	June 19, 1903.
Revised Statutes 1911, p. 2372.....	Weighing coal..... 285
Laws 1874, p. 1098.....	February 27, 1874.
1913.	
Revised Statutes 1913, p. 561.....	Burying dead miners.....
Revised Statutes (Hurd) 1874, p. 283.	
Revised Statutes 1913, p. 814.....	Explosives..... 13
Laws 1903, p. 159.....	May 15, 1903.
Revised Statutes 1913, p. 814.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1913, p. 837.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1913, p. 857.....	Salines..... 359
Revised Statutes 1845, p. 490.	
Revised Statutes 1913, p. 858.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1913, p. 858.....	Mining corporations..... 120
Laws 1897, p. 298.....	June 10, 1897.
Revised Statutes 1913, p. 858.....	Mining corporations..... 120
Laws 1891, p. 203.....	June 11, 1891.
Revised Statutes 1913, p. 1206.....	Workmen's compensation act..... 324
Laws 1911, p. 315.....	June 10, 1911.
Revised Statutes 1913, pp. 1541, 1660.....	Mining leases—Release..... 126
Laws 1907, p. 400.....	May 27, 1907.
Revised Statutes 1913, p. 1623.....	Mining operations..... 212
Laws 1911, p. 388.....	June 6, 1911.
Revised Statutes 1913, p. 1646.....	Shot firers..... 376
Laws 1905, p. 328.....	May 18, 1905.
Revised Statutes 1913, p. 1646.....	Shot firers..... 377
Laws 1907, p. 401.....	May 20, 1907.
Revised Statutes 1913, p. 1646.....	Shot firers..... 378
Laws 1913, p. 442.....	June 27, 1913.
Revised Statutes 1913, p. 1648.....	Oil..... 356
Laws 1905, p. 326.....	May 16, 1905.
Revised Statutes 1913, p. 1648.....	Oil..... 357
Laws 1911, p. 426.....	June 7, 1911.
Revised Statutes 1913, p. 1649.....	Examination of miners..... 92
Laws 1907-8, p. 90.....	June 1, 1908.
Revised Statutes 1913, p. 1649.....	Examination of miners..... 94
Laws 1900, p. 284.....	June 5, 1909.
Revised Statutes 1913, p. 1649.....	Examination of miners..... 96
Laws 1913, p. 438.....	June 27, 1913.
Revised Statutes 1913, p. 1651.....	Mine fire fighting equipment..... 33
Laws 1910, p. 84.....	March 8, 1910.
Revised Statutes 1913, p. 1653.....	Mine fire fighting and rescue stations..... 30
Laws 1913, p. 434.....	June 26, 1913.
Revised Statutes 1913, p. 1654.....	Mine fire fighting equipment..... 38
Laws 1911, p. 419.....	June 7, 1911.
Revised Statutes 1913, p. 1654.....	Mine fire fighting equipment..... 42
Laws 1913, p. 434.....	June 26, 1913.
Revised Statutes 1913, p. 1656.....	Mine fire fighting and rescue stations..... 28
Laws 1900-10, p. 2.....	March 4, 1910.
Revised Statutes 1913, p. 1656.....	Mine fire fighting and rescue stations..... 29
Laws 1911, p. 424.....	June 5, 1911.
Revised Statutes 1913, p. 1656.....	Mine fire fighting equipment..... 42
Laws 1913, p. 434.....	June 27, 1913.
Revised Statutes 1913, p. 1657.....	Explosives..... 16
Laws 1911, p. 385.....	June 7, 1911.
Revised Statutes 1913, p. 1659.....	Miner's lien..... 105
Laws 1895, p. 342.....	June 21, 1895.
Revised Statutes 1913, p. 1659.....	Explosives..... 17
Laws 1913, p. 431.....	June 26, 1913.
Revised Statutes 1913, p. 1660 (1841).....	Mining leases—Release..... 126
Laws 1913, p. 437.....	July 12, 1913.

	Page.
Revised Statutes 1913, p. 1661.....	60
Laws 1859, p. 126.....	February 18, 1859.
Revised Statutes 1913, p. 1661.....	Eminent domain.....
Laws 1867, p. 39.....	February 21, 1867. (Extra session.)
Revised Statutes 1913, p. 1661.....	Eminent domain.....
Laws 1874, p. 709.....	March 24, 1874.
Revised Statutes 1913, p. 1662.....	Mining rights—Conveyance.....
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1913, p. 1662.....	Minerals.....
Laws 1861, pp. 140-141.....	February 25, 1861.
Revised Statutes 1913, p. 1712.....	Oil.....
Laws 1874, p. 731.....	March 24, 1874.
Revised Statutes 1913, p. 1712.....	Oil.....
Laws 1913, p. 443.....	June 27, 1913.
Revised Statutes 1913, p. 1713.....	Oil.....
Laws 1871-72, pp. 566-567.....	April 9, 1872.
Revised Statutes 1913, p. 1713.....	Oil.....
Laws 1860, p. 259.....	April 19, 1860.
Revised Statutes 1913, p. 1713.....	Oil.....
Laws 1911, p. 432.....	May 29, 1911.
Revised Statutes 1913, p. 2025.....	Taxation.....
Laws 1893, p. 172.....	June 19, 1893.
Revised Statutes 1913, p. 2484.....	Weight of coal.....
Laws 1855, p. 176.....	February 14, 1855.

1915-16.

Revised Statutes 1915-16, p. 632.....	Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 283.....		
Revised Statutes 1915-16, p. 686.....	Mining corporations.....	123
Laws 1897, p. 285.....	June 11, 1897.	
Revised Statutes 1915-16, p. 880.....	Explosives.....	11
Laws 1887, p. 180.....	June 16, 1887.	
Revised Statutes 1915-16, p. 926.....	Salines.....	359
Revised Statutes 1845, p. 490.....		
Revised Statutes 1915-16, p. 927.....	Mining corporations.....	120
Laws 1891, p. 206.....	June 11, 1891.	
Revised Statutes 1915-16, p. 1036.....	Mining leases—Release.....	126
Laws 1907, p. 400.....	May 27, 1907.	
Revised Statutes 1915-16, p. 1725.....	Mining operations.....	213
Laws 1911, p. 388.....	June 6, 1911.	
Revised Statutes 1915-16, p. 1726.....	Mining operations.....	229
Laws 1913, p. 411.....	June 27, 1913.	
Revised Statutes 1915-16, p. 1729.....	Mining operations.....	238
Laws 1915, p. 505.....	June 28, 1915.	
Revised Statutes 1915-16, p. 1749.....	Shot firers.....	378
Law 1913, p. 442.....	June 27, 1913.	
Revised Statutes 1915-16, p. 1749.....	Shot firers.....	377
Laws 1907, p. 401.....	May 20, 1907.	
Revised Statutes 1915-16, p. 1749.....	Shot firers.....	376
Laws 1905, p. 328.....	May 18, 1905.	
Revised Statutes 1915-16, p. 1751.....	Oil.....	357
Laws 1911, p. 426.....	June 7, 1911.	
Revised Statutes, 1915-16, p. 1751.....	Oil.....	356
Laws 1905, p. 326.....	May 16, 1905.	
Revised Statutes 1915-16, p. 1752.....	Examination of miners.....	99
Laws 1915, p. 525.....	June 29, 1915.	
Revised Statutes 1915-16, p. 1752.....	Examination of miners.....	96
Laws 1913, p. 438.....	June 27, 1913.	
Revised Statutes 1915-16, p. 1755.....	Mine fire fighting equipment.....	33
Laws 1910, p. 84.....	March 8, 1910.	
Revised Statutes 1915-16, p. 1757.....	Mine fire fighting equipment.....	38
Laws 1911, p. 419.....	June 7, 1911.	
Revised Statutes 1915-16, p. 1760.....	Mine fire fighting and rescue stations.....	29
Laws 1911, p. 424.....	June 5, 1911.	
Revised Statutes 1915-16, p. 1760.....	Mine fire fighting and rescue stations.....	28
Laws 1909-10, p. 2.....	March 4, 1910.	

	Page.
Revised Statutes 1915-16, p. 1761.....	Explosives..... 16
Laws 1911, p. 338.....	June 7, 1911.
Revised Statutes 1915-16, p. 1763.....	Miner's Reus..... 105
Laws 1895, p. 242.....	June 21, 1895.
Revised Statutes 1915-16, p. 1763.....	Explosives..... 17
Laws 1913, p. 431.....	June 26, 1913.
Revised Statutes 1915-16, p. 1765.....	Mine inspectors..... 46
Laws 1891, p. 167.....	June 18, 1891.
Revised Statutes 1915-16, p. 1765.....	Eminent domain..... 6
Revised Statutes 1874, p. 709.....	March 24, 1874.
Revised Statutes 1915-16, p. 1766.....	Minerals..... 57
Laws 1861, p. 140.....	February 25, 1861.
Revised Statutes 1915-16, p. 1756.....	Mine fire fighting equipment..... 44
Laws 1915, p. 522.....	June 23, 1915.
Revised Statutes 1915-16, p. 1764.....	Mining leases—Release..... 123
Laws 1913, p. 437.....	July 12, 1913.
Revised Statutes 1915-16, p. 1765.....	Miners' wages..... 109
Laws 1897, p. 270.....	June 3, 1897.
Revised Statutes 1915-16, p. 1766.....	Mineral lands..... 60
Laws 1859, p. 126.....	February 18, 1859.
Revised Statutes 1915-16, p. 1766.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1915-16, p. 1820.....	Oil..... 353
Laws 1915, p. 531.....	June 29, 1915.
1917.	
Revised Statutes 1917, pp. 699-910.....	Department of mines and minerals..... 437
Laws 1917, p. 4.....	March 27, 1917.
Revised Statutes 1917, p. 692.....	Burying dead miners..... 1
Laws 1917, p. 341.....	June 26, 1917.
Revised Statutes 1917, p. 751.....	Mining corporations..... 123
Laws 1897, p. 285.....	June 11, 1897.
Revised Statutes 1917, p. 958.....	Explosives..... 11
Laws 1887, p. 180.....	June 16, 1887.
Revised Statutes 1917, p. 1007.....	Salines..... 359
Revised Statutes 1845, p. 490.	
Revised Statutes 1917, p. 1008.....	Mineral lands..... 58
Laws 1863, p. 70.....	February 13, 1863.
Revised Statutes 1917, p. 1008.....	Mining corporations..... 120
Laws 1891, p. 206.....	June 11, 1891.
Revised Statutes 1917, p. 1412.....	Miners' wages..... 110
Laws 1913, p. 359.....	June 21, 1913.
Revised Statutes 1917, p. 1448.....	Workmen's compensation act..... 403
Laws 1913, p. 335.....	June 28, 1913.
Revised Statutes 1917, p. 1457.....	Workmen's compensation act..... 419
Laws 1915, p. 400.....	June 28, 1915.
Revised Statutes 1917, p. 1944.....	Mining operations..... 212
Laws 1911, p. 338.....	June 6, 1911.
Revised Statutes 1917, p. 1945.....	Mining operations..... 229
Laws 1913, p. 412.....	June 27, 1913.
Revised Statutes 1917, p. 1947.....	Mining operations..... 233
Laws 1915, p. 505.....	June 28, 1915.
Revised Statutes 1917, p. 1968.....	Shot firers..... 377
Laws 1907, p. 401.....	May 20, 1907.
Revised Statutes 1917, p. 1968.....	Shot firers..... 376
Laws 1905, p. 328.....	May 18, 1905.
Revised Statutes 1917, pp. 1968, 1969.....	Shot firers..... 373
Laws 1913, p. 442.....	June 27, 1913.
Revised Statutes 1917, p. 1970.....	Oil..... 357
Laws 1911, p. 426.....	June 7, 1911.
Revised Statutes 1917, p. 1971.....	Examination of miners..... 92
Laws 1907-8, p. 90.....	June 1, 1906.
Revised Statutes 1917, p. 1971.....	Examination of miners..... 91
Laws 1909, p. 234.....	June 5, 1909.
Revised Statutes 1917, p. 1971.....	Examination of miners..... 90
Laws 1915, p. 525.....	June 29, 1915.

	Page.
Revised Statutes 1917, p. 1974.....	Mine fire fighting equipment..... 44
Laws 1915, p. 522.....	June 23, 1915.
Revised Statutes 1917, p. 1974.....	Mine fire fighting equipment..... 33
Laws 1909-10, p. 84.....	March 8, 1910.
Revised Statutes 1917, pp. 1976, 1978.....	Mine fire fighting equipment..... 38
Laws 1911, p. 419.....	June 7, 1911.
Revised Statutes 1917, p. 1979.....	Mine fire fighting and rescue stations. 31
Laws 1915, p. 527.....	June 23, 1915.
Revised Statutes 1917, p. 1979.....	Mine fire fighting and rescue stations. 29
Laws 1911, p. 424.....	June 5, 1911.
Revised Statutes 1917, p. 1979.....	Mine fire fighting and rescue stations. 28
Laws 1909-10, p. 2.....	March 4, 1910.
Revised Statutes 1917, p. 1980.....	Explosives..... 16
Laws 1911, p. 385.....	June 7, 1911.
Revised Statutes 1917, p. 1982.....	Miner's liens..... 105
Laws 1905, p. 242.....	June 21, 1905.
Revised Statutes 1917, p. 1982.....	Explosives..... 17
Laws 1913, p. 431.....	June 26, 1913.
Revised Statutes 1917, p. 1983.....	Mining leases—Release..... 126
Laws 1913, p. 437.....	July 12, 1913.
Revised Statutes 1917, p. 1984.....	Eminent domain..... 6
Revised Statutes 1874 (Hurd), p. 709.....	March 24, 1874.
Revised Statutes 1917, p. 1986.....	Minerals..... 57
Laws 1861, p. 140.....	February 25, 1861.
Revised Statutes 1917, p. 1985.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Revised Statutes 1917, p. 1986.....	Mineral lands..... 66
Laws 1859, p. 126.....	February 18, 1859.
Revised Statutes 1917, p. 2000.....	Weight of coal..... 365
Laws 1855, p. 176.....	February 14, 1855.

JONES & ADDINGTON STATUTES.

REVISIONS COMPILED AND ANNOTATED.

2 JONES & ADDINGTON STATUTES.

	Page
Jones & Addington, p. 1506.....	1
Revised Statutes (Hurd), 1874, p. 283.	
Jones & Addington Statutes 1506.....	1
Laws 1855, p. 170.	
Jones & Addington Statutes, p. 1809.....	107
Laws 1891, p. 213.....	April 23, 1891.
Jones & Addington Statutes, p. 1656-1657.....	120
Laws 1897, p. 208.....	June 10, 1897.
Jones & Addington Statutes, p. 1904.....	120
Laws 1891, p. 206.....	June 11, 1891.
Laws 1893, p. 89.....	June 20, 1893.
Laws 1897, p. 208.....	June 10, 1897.
Jones & Addington Statutes, p. 2029.....	11
Laws 1887, p. 180.....	June 16, 1887.
Jones & Addington Statutes, p. 2031.....	13
Laws 1903, p. 159.....	May 15, 1903.
Jones & Addington Statutes, p. 2097.....	58
Laws 1863, p. 70.....	February 13, 1863.
Jones & Addington Statutes, p. 2155.....	350
Revised Statutes 1845, p. 490.	
Jones & Addington Statutes, p. 2161.....	58
Laws 1863, p. 70.....	February 13, 1863.
Jones & Addington Statutes, p. 2163.....	106
Laws 1891, p. 212.....	May 28, 1891.

3 JONES & ADDINGTON STATUTES.

Jones & Addington Statutes, p. 2014.....	394
Laws 1911, p. 315.....	June 10, 1911.

4 JONES & ADDINGTON STATUTES.

Jones & Addington Statutes, p. 3997.....	105
Laws 1895, p. 242.....	June 21, 1895.
Jones & Addington Statutes, p. 4190.....	212
Laws 1911, p. 388.....	June 6, 1911.
Jones & Addington Statutes, pp. 4191-4254.....	Mining operations 141, 151, 187, 205, 212, 229
Laws 1879, p. 204.....	May 28, 1879.
Laws 1885, p. 217.....	June 30, 1885.
Laws 1899, p. 301.....	April 18, 1899.
Laws 1907, p. 387.....	May 28, 1907.
Laws 1911, p. 388.....	June 6, 1911.
Laws 1913, p. 412.....	June 27, 1913.
Jones & Addington Statutes, p. 4254.....	48
Laws 1891, p. 167.....	June 18, 1891.
Jones & Addington Statutes, p. 4254.....	162
Laws 1895, p. 252.....	June 15, 1895.
Jones & Addington Statutes, p. 4255.....	123
Laws 1893, p. 165.....	June 21, 1893.
Laws 1897, p. 285.....	June 11, 1897.
Jones & Addington Statutes, p. 4255.....	109
Laws 1897, p. 270.....	June 3, 1897.
Jones & Addington Statutes, p. 4256.....	111
Laws 1903, p. 252.....	May 14, 1903.

	Page.
Jones & Addington Statutes, p. 4256-4258.....	Shot firers..... 376, 377
Laws 1905, p. 323.....	May 18, 1905.
Laws 1907, p. 401.....	May 20, 1907.
Jones & Addington Statutes, p. 4258-4262.....	Examination of miners..... 92, 94
Laws 1907-8, p. 90.....	June 1, 1908. (Adjourned session.)
Laws 1909, p. 284.....	June 5, 1909.
Jones & Addington Statutes, p. 4262.....	Examination of miners..... 92
Laws 1907, p. 268.....	June 7, 1907.
Jones & Addington Statutes, p. 4265-4266.....	Eminent domain..... 6
Revised Statutes 1874, p. 709.....	March 24, 1874.
Jones & Addington Statutes, p. 4266.....	Eminent domain..... 5
Laws 1887, p. 39.....	February 21, 1887. (Second session.)
Jones & Addington Statutes, p. 4266-4267.....	Mineral lands..... 60
Laws 1859, p. 126.....	February 18, 1859.
Jones & Addington Statutes, p. 4267.....	Mining rights—Conveyance..... 343
Laws 1861, p. 146.....	February 20, 1861.
Jones & Addington Statutes, p. 4268.....	Minerals..... 57
Laws 1861, pp. 140-41.....	February 25, 1861.
Jones & Addington Statutes, p. 4269.....	Oil..... 356, 357
Laws 1905, p. 326.....	May 16, 1905.
Laws 1911, p. 426.....	June 7, 1911.
Jones & Addington Statutes, p. 4270-71.....	Mining leases—Release..... 126
Laws 1907, p. 400.....	May 27, 1907
Jones & Addington Statutes, p. 4271-4273.....	Mine fire fighting and rescue stations 28, 29
Laws 1909-10, p. 2.....	March 4, 1910.
Laws 1911, p. 424.....	June 5, 1911.
Jones & Addington Statutes, p. 4273-4278.....	Mine fire fighting equipment..... 33, 38
Laws 1909-10, p. 84.....	March 8, 1910.
Laws 1911, p. 419.....	June 7, 1911.
Jones & Addington Statutes, p. 4278.....	Miners' institutes..... 104
Laws 1911, p. 329.....	May 25, 1911.
Jones & Addington Statutes, p. 4481.....	Oil..... 346, 347, 349, 350, 351
Laws 1899, p. 259.....	April 19, 1899.
Laws 1871-72, p. 566.....	April 9, 1872.
Revised Statutes, 1874, p. 731.....	March 12, 1874.
Laws 1887, p. 242.....	June 17, 1887.
Laws 1911, p. 432.....	May 29, 1911.
Jones & Addington Statutes, p. 4267.....	Mineral lands..... 60
Revised Statutes, 1874, p. 709.....	March 24, 1874.

5 JONES & ADDINGTON STATUTES.

Jones & Addington Statutes, p. 5454-5465.....	Taxation..... 343, 381, 382, 383
Laws 1871-72, pp. 1, 11.....	March 20, 1872.
Revised Statutes 1874, p. 709.....	March 24, 1874.
Laws 1893, p. 172.....	June 19, 1893. (Amendatory act.)
Laws 1905, p. 353.....	May 18, 1905.

6 JONES & ADDINGTON STATUTES.

Jones & Addington Statutes, p. 6365.....	Mining engineering department... 10
Laws 1909, p. 43.....	June 8, 1909.
Jones & Addington Statutes, p. 6365-6366.....	Geologist..... 24, 26
Laws 1905, p. 30.....	May 12, 1905.
Laws 1911, p. 517.....	May 25, 1911.
Jones & Addington Statutes, p. 6369.....	Weighing coal..... 383
Laws 1855, p. 176.....	February 14, 1855.
Revised Statutes 1874, p. 1098.....	February 27, 1874.

STARR & CURTISS STATUTES.

REVISIONS COMPILED AND ANNOTATED.

1885.

1 STARR & CURTISS STATUTES.

	Page.
Starr & Curtiss Statutes, 1885, p. 606.....	1
Revised Statutes (Hurd) 1874, p. 283.....	
Starr & Curtiss Statutes 1885, p. 799.....	58
Laws 1863, p. 70.....	February 13, 1863.
Starr & Curtiss Statutes 1885, p. 823.....	359
Revised Statutes 1848, p. 490.....	
Starr & Curtiss Statutes 1885, p. 828.....	58
Laws 1863, p. 70.....	February 13, 1863.
Starr & Curtiss Statutes 1885, p. 918.....	7
Laws 1877, p. 95.....	May 16, 1877.
Starr & Curtiss Statutes 1885, p. 919.....	8
Laws 1879, p. 120.....	May 29, 1879.

2 STARR & CURTISS STATUTES.

Starr & Curtiss Statutes 1885, p. 1616-1625.....	141
Laws 1879, p. 204.....	May 28, 1879.
Starr & Curtiss Statutes 1885, p. 1617-1625.....	146
Laws 1883, p. 116.....	June 18, 1883.
Starr & Curtiss Statutes 1885, p. 1618-1625.....	150
Laws 1883, p. 114.....	June 21, 1883.
Starr & Curtiss Statutes 1885, p. 1626.....	6
Laws 1874, p. 709.....	March 24, 1874.
Starr & Curtiss Statutes 1885, p. 1626-1637.....	5
Laws 1867, p. 39.....	February 21, 1867.
(Extra session.)	
Starr & Curtiss Statutes 1885, p. 1637.....	60
Laws 1859, p. 126.....	February 12, 1859.
Starr & Curtiss Statutes 1885, p. 1637.....	343
Laws 1861, p. 146.....	February 20, 1861.
Starr & Curtiss Statutes 1885, p. 1637.....	343
Laws 1861, p. 146.....	February 20, 1861.
Starr & Curtiss Statutes 1885, p. 1637-1638.....	57
Laws 1861, p. 140-141.....	February 28, 1861.
Starr & Curtiss Statutes 1885, p. 1639-1639.....	366
Laws 1883, p. 113.....	June 14, 1883.
Starr & Curtiss Statutes, 1885, p. 1639-1663.....	346
Laws 1874, p. 731.....	March 12, 1874.
Starr & Curtiss Statutes 1885, p. 1661-1663.....	347
Laws 1871-72, p. 586-588.....	April 2, 1872.
Starr & Curtiss Statutes 1885, p. 1661-1663.....	346
Laws 1869, p. 259-260.....	April 19, 1869.
Starr & Curtiss Statutes 1885, p. 2631.....	351
Laws 1871-72, p. 1.....	March 30, 1872.
Starr & Curtiss Statutes 1885, p. 2661-2662.....	365
Laws 1854, p. 178.....	February 14, 1855.
Laws 1874, p. 1668.....	February 27, 1874.

1885-1887.

3 STARR & CURTISS STATUTES (SUPPLEMENT).

	Page.
Starr & Curtiss Statutes (supplement) 1885-1887, p. 165.....Oil.....	354
Laws 1887, p. 96.....June 6, 1887.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 169.....Explosives.....	11
Laws 1887, p. 180.....June 16, 1887.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 179.....Eminent domain.....	8
Laws 1886, p. 109.....June 20, 1886.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 393-400...Mining operations.....	141
Laws 1879, p. 304.....May 26, 1879.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 393-400...Mining operations.....	150
Laws 1883, p. 114.....June 21, 1883.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 393-400...Mining operations.....	151
Laws 1885, p. 217.....June 30, 1885.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 397.....Mining operations.....	155
Laws 1887, p. 231.....June 16, 1887.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 401.....Weighing coal.....	386
Laws 1883, p. 113.....June 14, 1883.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 401-403...Weighing coal.....	388
Laws 1885, p. 221.....June 29, 1885.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 403.....Weighing coal.....	389
Laws 1887, p. 235.....June 17, 1887.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 411.....Oil.....	349
Laws 1874, p. 731.....March 12, 1874.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 411.....Oil.....	350
Laws 1887, p. 242.....June 17, 1887.	
Starr & Curtiss Statutes (supplement) 1885-1887, p. 539.....Weight of coal.....	385
Laws 1874, p. 1098.....February 27, 1874.	

1896.

1 STARR & CURTISS STATUTES.

Starr & Curtiss Statutes 1896, p. 984.....Burying dead miners.....	1
Laws 1865, p. 170. (Revised Statutes (Hurd) 1874, p. 233.)	
Starr & Curtiss Statutes 1896, p. 1038.....Miners' wages.....	107
Laws 1891, p. 213.....April 23, 1891.	
Starr & Curtiss Statutes 1896, p. 1252.....Mining corporations.....	120
Laws 1891, p. 206.....June 11, 1891.	
Starr & Curtiss Statutes 1896, p. 1276-1278.....Explosives.....	11
Laws 1887, p. 180.....June 16, 1887.	
Starr & Curtiss Statutes 1896, p. 1304.....Oil.....	354
Laws 1887, p. 96.....June 6, 1887.	
Starr & Curtiss Statutes 1896, p. 1314.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.	
Starr & Curtiss Statutes 1896, p. 1347.....Salines.....	359
Revised Statutes 1845, p. 490.	
Starr & Curtiss Statutes 1896, p. 1350.....Mineral lands.....	58
Laws 1863, p. 70.....February 13, 1863.	
Starr & Curtiss Statutes 1896, p. 1351-1352.....Miners' wages.....	106
Laws 1891, p. 212.....May 28, 1891.	

2 STARR & CURTISS STATUTES.

Starr & Curtiss Statutes 1896, p. 984.....Burying dead miners.....	1
Revised Statutes (Hurd) 1874, p. 233.	
Starr & Curtiss Statutes 1896, p. 1500.....Eminent domain.....	8
Laws 1879, p. 120.....May 29, 1879.	
Starr & Curtiss Statutes 1896, p. 2717-2723.....Mining operations.....	159
Laws 1889, p. 202-207.....June 4, 1889.	
Starr & Curtiss Statutes 1896, p. 2717-2731.....Mining operations.....	141
Laws 1879, p. 204.....May 28, 1879.	
Starr & Curtiss Statutes 1896, p. 2717-2731.....Mining operations.....	146
Laws 1883, p. 116.....June 13, 1883.	

	Page.
Starr & Curtiss Statutes 1896, p. 2720.....	Mining operations..... 153
Laws 1887, p. 231-234.....	June 16, 1887.....
Starr & Curtiss Statutes 1896, p. 2720.....	Mining operations..... 162
Laws 1895, p. 252-258.....	June 21, 1895.....
Starr & Curtiss Statutes 1896, p. 2726.....	Mining operations..... 151
Laws 1885, p. 217-220.....	June 30, 1885.....
Starr & Curtiss Statutes 1896, p. 2731.....	Mining operations..... 150
Laws 1883, p. 114.....	June 21, 1883.....
Starr & Curtiss Statutes 1896, p. 2731-2732.....	Mine managers..... 14
Laws 1891, p. 168.....	June 18, 1891.....
Starr & Curtiss Statutes 1896, p. 2733.....	Mine inspectors..... 48
Laws 1891, p. 167.....	June 18, 1891.....
Starr & Curtiss Statutes 1896, p. 2733.....	Mine inspectors..... 46
Laws 1895, p. 255.....	June 4, 1895.....
Starr & Curtiss Statutes 1896, p. 2734.....	Fire bosses and hoisting engineers.. 58
Laws 1895, p. 250.....	June 21, 1895.....
Starr & Curtiss Statutes 1896, p. 2735.....	Oil.....
Laws 1895, p. 256.....	April 30, 1895.....
Starr & Curtiss Statutes 1896, p. 2736.....	Mining corporations..... 123
Laws 1893, p. 165.....	June 21, 1893.....
Starr & Curtiss Statutes 1896, p. 2738.....	Eminent domain..... 6
Laws 1874, p. 709.....	March 24, 1874.....
Starr & Curtiss Statutes 1896, p. 2739.....	Mineral lands..... 60
Laws 1859, p. 126.....	February 18, 1859.....
Starr & Curtiss Statutes 1896, p. 2739.....	Eminent domain..... 5
Laws 1867, p. 39.....	February 21, 1867. (Extra session.)
Starr & Curtiss Statutes 1896, p. 2740.....	Mining rights—Conveyances..... 243
Laws 1861, p. 146.....	February 20, 1861.....
Starr & Curtiss Statutes 1896, p. 2740.....	Minerals..... 57
Laws 1861, p. 140-141.....	February 25, 1861.....
Starr & Curtiss Statutes 1896, p. 2741.....	Weighing coal..... 301
Laws 1891, p. 170.....	June 16, 1891.....
Starr & Curtiss Statutes 1896, p. 2741.....	Weighing coal..... 363
Laws 1887, p. 235.....	June 17, 1887.....
Starr & Curtiss Statutes 1896, p. 2742.....	Weighing coal..... 301
Laws 1891, p. 170.....	June 10, 1891.....
Starr & Curtiss Statutes 1896, p. 2839.....	Oil..... 350
Laws 1887, p. 242.....	June 17, 1887.....
Starr & Curtiss Statutes 1896, p. 2839-2841.....	Oil..... 349
Laws 1874, p. 731.....	March 12, 1874.....
Starr & Curtiss Statutes 1896, p. 2839-2841.....	Oil..... 347
Laws 1871-72, p. 566-568.....	April 9, 1872.....
Starr & Curtiss Statutes 1896, p. 2839-2841.....	Oil..... 343
Laws 1899, p. 259.....	April 19, 1899.....
Starr & Curtiss Statutes 1896, p. 3996-3997.....	Weight of coal..... 285
Laws 1855, p. 176.....	February 14, 1855.....
Starr & Curtiss Statutes 1896, p. 3996-3997.....	Weight o. coal..... 285
Laws 1874, p. 1008.....	February 27, 1874.....

1902.

4 STARR & CURTISS STATUTES.

JONES & ADDINGTON SUPPLEMENT.

Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 338.....	Mining corporations..... 120
Laws 1897, p. 208.....	June 10, 1897.....
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 366.....	Mining corporations..... 123
Laws 1891, p. 206.....	June 11, 1891.....
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 843-867.....	Mining operations..... 187
Laws 1899, p. 301.....	April 18, 1899.....
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 867.....	Oil..... 251
Laws 1895, p. 256.....	April 30, 1895.....
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 867.....	Oil..... 55
Laws 1901, p. 247.....	May 11, 1901.....

	Page.
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 867.....Miners' wages.....	109
Laws 1897, p. 270.....June 3, 1897.	
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 868.....Mining corporations.....	123
Laws 1897, p. 285.....June 11, 1897.	
Starr & Curtiss Statutes 1902 (J. & A. Supp.), p. 868.....Mining corporations.....	123
Laws 1893, p. 165.....June 21, 1893.	

1903.

5 STARR & CURTISS STATUTES.

JONES & ADDINGTON SUPPLEMENT.

Starr & Curtiss Statutes 1903 (J. & A. Supp.), p. 165.....Explosives.....	11
Laws 1887, p. 180.....June 16, 1887.	
Starr & Curtiss Statutes 1903 (J. & A. Supp.), p. 166.....Explosives.....	13
Laws 1903, p. 159.....May 15, 1903.	
Starr & Curtiss Statutes 1903 (J. & A. Supp.), p. 385-387.....Mining operations.....	187
Laws 1899, p. 301.....April 18, 1899.	
Starr & Curtiss Statutes 1903 (J. & A. Supp.), p. 386.....Mining operations.....	203
Laws 1903, p. 250.....May 14, 1903.	
Starr & Curtiss Statutes 1903 (J. & A. Supp.), p. 388.....Explosives.....	18
Laws 1903, p. 252.....May 14, 1903.	
Starr & Curtiss Statutes 1903 (J. & A. Supp.), p. 388.....Miners' washrooms.....	111
Laws 1903, p. 252.....May 14, 1903.	

54915°—19—Bull. 169—33

TABLE OF ILLINOIS CASES.

A

	Page.
Aetitus v. Spring Valley Coal Co., 246 Ill. 32, 92 N. E. 579..	173, 256, 259, 267, 283, 288, 290, 296, 306, 308, 320, 339
Aetitus v. Spring Valley Coal Co., 150 Ill. App. 497.....	256, 267, 288, 320, 338, 339
Alexander v. Donk Bros. Coal & Coke Co., 149 Ill. App. 378.....	321
Andrewzewski v. Gallatin Coal & Coke Co., 143 Ill. App. 418.....	298
Arley v. Niblack, 272 Ill. 356, 112 N. E. 67.....	263, 323, 336, 340
Athens Min. Co. v. Carnduff 221 Ill. 354, 77 N. E. 571.....	177, 180, 311, 321, 340
Athens Min. Co. v. Carnduff, 129 Ill., App. 178.....	178, 182

B

Bailey v. People, 190 Ill. 28, 60 N. E. 93.....	111
Bartlett Coal & Min. Co. v. Roach, 68 Ill. 174.....	138, 139, 180, 265, 337
Bateman v. Carterville & Big Muddy Coal Co., 188 Ill. App. 357.....	431, 432, 433
Baziles v. O'Gara Coal Co., 186 Ill. App. 583.....	270, 271
Beard v. Skeldon, 113 Ill. 584.....	178, 185, 265, 322, 325, 327
Beard v. Skeldon, 13 Ill. App. 54.....	177, 178, 184, 185, 265, 341
Beaucoup Coal Co. v. Cooper, 12 Ill. App. 373.....	183
Bell v. Toluca Coal Co., 272 Ill. 576, 112 N. E. 311.....	434
Beveridge v. Illinois Fuel Co., — Ill. —, 119 N. E. 46.....	432
Big Muddy Coal & Iron Co. v. Industrial Board, etc. 279 Ill. 235 116 N. E. 662.....	435
Bisel v. Kerens-Donnewald Coal Co., 153 Ill. App. 8.....	263
Borders v. Uhe, 88 Ill. App. 634.....	105
Braceville Coal Co. v. People, 147 Ill. 66, 35 N. E. 62.....	107, 108, 111, 329
Brack v. Berry Coal Co., 174 Ill. App. 609.....	277
Bradley v. Chicago-Virden Coal Co., 231 Ill. 622, 83 N. E. 424.....	316, 317, 319, 333
Brennan v. Chicago & Carterville Coal Co., 147 Ill. App. 263.....	323, 327, 341, 342
Brennan v. Chicago & Carterville Coal Co., 241 Ill. 610, 89 N. E. 756.....	254, 259, 326, 332, 333
Brookside Coal Min. Co. v. Dolph, 101 Ill. App. 169.....	268, 269, 305, 306
Brookside Coal Min. Co. v. Hajnal, 101 Ill. App. 175.....	268, 269
Brown v. Kelly Coal Co., 162 Ill. App. 65.....	288, 290, 300, 312
Brunnworth v. Kerens-Donnewald Coal Co., 260 Ill. 202, 103 N. E. 178.....	138, 247, 265, 267, 275, 304, 313, 314, 319, 331, 332, 333, 334, 340, 390
Brunnworth v. Kerens-Donnewald Coal Co., 169 Ill. App. 68.....	264, 265, 267, 313, 319, 331

C

Calumet Iron & Steel Co. v. Martin, 115 Ill. 358, 3 N. E. 456.....	180
Cappellin v. Jones & Adams Coal Co., 164 Ill. App. 267.....	274, 298, 301, 303
Carney v. Marquette Third Veln Coal Co., 175 Ill. App. 139.....	307
Carter v. Sangamon Coal Co., 162 Ill. App. 8.....	262, 310
Carterville Coal Co. v. Abbott, 181 Ill. 496, 55 N. E. 131.....	3, 167, 172, 178, 179, 180, 182, 271, 305, 309, 319, 331, 332, 333, 335
Carterville Coal Co. v. Abbott, 81 Ill. App. 279.....	167, 179, 180, 182
Carterville Coal Co. v. Cooke, 129 Ill. 152.....	310, 312
Carterville-Herrin Coal Co. v. Moake, 128 Ill. App. 133.....	277, 311, 313
Casparis Stone Co. v. Industrial Board, etc., 278 Ill. 77, 115 N. E. 822.....	430, 431, 434, 435
Catlett v. Young, 143 Ill. 74, 32 N. E. 447.....	138, 139, 173, 176, 179, 180, 181, 182, 249, 256, 288, 305, 316, 337
Catlett v. Young, 38 Ill. App. 198.....	139, 177, 181, 182
Catlin Coal Co. v. Lloyd, 176 Ill. 275, 52 N. E. 144.....	344
Chicago-Virden Coal Co. v. Bradley, 134 Ill. App. 234.....	328, 329
Chicago-Virden Coal Co. v. Rucker, 116 Ill. App. 426.....	322, 339
Chicago, Wilmington, etc., Coal Co. v. Moran, 210 Ill. 9, 71 N. E. 38.....	319
Chicago, Wilmington, etc., Coal Co. v. People, 181 Ill. 270, 54 N. E. 961.....	3, 169, 172, 249
Chicago, Wilmington, etc., Coal Co. v. People, 241 Ill. 421.....	121, 122, 123
Chicago, Wilmington, etc., Coal Co. v. People, 114 Ill. App. 76.....	121, 122
Chicago, Wilmington, etc., Coal Co. v. Peterson, 39 Ill. App. 114.....	180, 181, 182

	Page.
Clark v. O'Sara Coal Co., 140 Ill. App. 207.....	345, 359
Coal Run Coal Co. v. Coughlin, 19 Ill. App. 412.....	123, 129, 130
Coal Run Coal Co. v. Jones, 127 Ill. 379, 8 N. E. 865, 29 N. E. 29.....	170, 171, 310, 321
Coal Run Coal Co. v. Jones, 19 Ill. App. 371.....	179, 171, 180
Conover v. Harrisburg & Southern Coal Co., 122 Ill. App. 74.....	264, 326, 370, 380
Consolidated Coal Co. v. Baker, 135 Ill. 545, 26 N. E. 651.....	304, 305
Consolidated Coal Co. v. Bokamp, 181 Ill., 9, 54 N. E. 567.....	268, 271, 332
Consolidated Coal Co. v. Donbrowaki, 106 Ill. App. 681.....	323, 341
Consolidated Coal Co. v. Fleischbein, 207 Ill. 593, 69 N. E. 576.....	261
Consolidated Coal Co. v. Gruber, 125 Ill. 594, 59 N. E. 284.....	261
Consolidated Coal Co. v. Lumsden, 194 Ill. 594, 63 N. E. 1079.....	267, 268
Consolidated Coal Co. v. Lumsden, 97 Ill. App. 129.....	267, 268
Consolidated Coal Co. v. Maacki, 120 Ill. 551, 23 N. E. 715.....	126, 324, 326
Consolidated Coal Co. v. Pearson, 66 Ill. App. 424.....	129, 170, 176, 184
Consolidated Coal Co. v. People, 189 Ill. 124, 52 N. E. 829.....	3, 108, 189, 172, 268
Consolidated Coal Co. v. Schellier, 42 Ill. App. 619.....	129, 170, 176, 183
Consolidated Coal Co. v. Schieber, 66 Ill. App. 304.....	126, 176, 184, 271
Consolidated Coal Co. v. Seniger, 179 Ill. 379, 52 N. E. 733.....	261, 262, 264
Consolidated Coal Co. v. Steins, 129 Ill. App. 240.....	273
Consolidated Coal Co. v. Wornbacher, 124 Ill. 57, 24 N. E. 627.....	170, 200
Consolidated Coal Co. v. Yung, 24 Ill. App. 255.....	139, 170, 176, 184, 323
Cook v. Big Muddy-Cartersville Min. Co., 249 Ill. 41, 94 N. E. 90.....	2
	3, 277, 270, 285, 286, 280, 297, 305, 305, 306, 312, 313, 316, 317, 324, 326, 331, 340, 342
Cox v. Mt. Olive & Staunton Coal Co., 127 Ill. App. 24.....	173, 292
Crooks v. Tasewell Coal Co., 263 Ill. 343, 105 N. E. 132.....	292, 339, 430, 431, 432, 433, 434
Cynkus v. Big Muddy Coal & Iron Co., 190 Ill. App. 602.....	431, 432

D

Daniels v. Hyland, 77 Ill. 640.....	169
Darling v. Wood, 168 Ill. App. 272.....	264, 314, 334
Davis v. Big Muddy Coal & Iron Co., 173 Ill. App. 162.....	284, 285, 314
Davis v. Illinois Collieries Co., 232 Ill. 284, 83 N. E. 836.....	179,
	182, 249, 254, 256, 258, 259, 260, 288, 308, 309, 320, 322, 323, 334, 341, 379, 380
Davis v. Missouri & Illinois Coal Co., 186 Ill. App. 478.....	291, 292, 307, 318, 321, 333, 335, 340
Davis Min. Co. v. Gettleman. See Pettinger & Davis Min. Co. v. Gettleman.	
Demerski v. Citizen's Coal Min. Co., 149 Ill. App. 512.....	285
Dickerson v. Hamletta Coal Co., 251 Ill. 292, 96 N. E. 225.....	273
Dietz v. Big Muddy Coal & Iron Co., 263 Ill. 490, 106 N. E. 289.....	430, 431, 432, 433, 434
Dobbies v. Electric Coal Co., 158 Ill. App. 357.....	310, 316, 317
Donaldson v. Spring Valley Coal Co., 176 Ill. App. 224.....	255, 286, 300
Donk Bros. Coal & Coke Co. v. Lucas, 226 Ill. 23, 80 N. E. 590.....	3, 272, 276, 277
Donk Bros. Coal & Coke Co. v. Lucas, 127 Ill. App. 61.....	248, 254, 257, 258, 259, 261, 308
Donk Bros. Coal & Coke Co. v. Peton, 192 Ill. 41, 61 N. E. 390.....	174, 179, 280, 276, 277, 306, 309, 322
Donk Bros. Coal & Coke Co. v. Peton, 95 Ill. App. 193.....	175, 178, 179, 276
Donk Bros. Coal & Coke Co. v. Sapp, 133 Ill. App. 92.....	266, 324
Donk Bros. Coal Co. v. Stroff, 200 Ill. 453, 66 N. E. 29.....	182, 280, 305, 307, 308, 331, 338, 342
Donk Bros. Coal Co. v. Stroff, 100 Ill. App. 576.....	182, 305, 307, 308, 319, 324, 332, 335, 382
Driss v. Jones & Adams Coal Co., 171 Ill. App. 139.....	251, 274, 295
Dunham v. Black Diamond Coal Co., 239 Ill. 487, 89 N. E. 216.....	3, 293, 294, 296, 297, 313
Dunham v. Black Diamond Coal Co., 146 Ill. App. 140.....	282, 284, 292

E

Eaton v. Marion County Coal Co., 257 Ill. 567, 101 N. E. 58.....	254, 255, 297, 330, 331
Eaton v. Marion County Coal Co., 173 Ill. App. 444.....	390, 312, 340
Eden v. People, 161 Ill. 286, 43 N. E. 1108.....	111
Eliam v. Majestic Coal Co., 154 Ill. App. 275.....	272, 331
Elcorado Coal & Coke Co. v. Swan, 227 Ill. 595, 81 N. E. 691.....	138,
	174, 179, 256, 267, 288, 298, 304, 306, 320, 323, 334
Emerling v. Spring Valley Coal Co., 149 Ill. App. 97.....	256, 315
Eslick v. Illinois Collieries Co., 149 Ill. App. 607.....	300, 301, 323

F

Favre v. Superior Coal Co., 188 Ill. App. 203.....	431, 432, 433
Felchner v. Consolidated Coal Co., 176 Ill. App. 411.....	255, 294, 296, 301, 297, 313
Franci v. Tasewell Coal Co., 157 Ill. App. 477.....	263, 290, 305, 321, 326, 287

	Page.
French v. Clover Leaf Coal Min. Co., 180 Ill. App. 400.....	342, 430, 431, 432
Frey v. Kerens-Donnewald Coal Co., 271 Ill. 121, 110 N. E. 824.....	240, 430
Frey v. Kerens-Donnewald Coal Co., 182 Ill. App. 548.....	321, 332
Fraser v. People, 141 Ill. 171, 81 N. E. 385.....	107, 111
Fruit v. Industrial Board, etc., — Ill. —, 119 N. E. 981.....	431, 436
Fuchs v. Consolidated Coal Co., 157 Ill. App. 41.....	286, 331

G

Gallatin Coal & Coke Co. v. Andrewzewski, 137 Ill. App. 1.....	274, 298, 301
Galles v. Kelly Coal Co., 151 Ill. App. 178.....	309
Gibson v. Wasson Coal Co., 180 Ill. App. 599.....	288, 341
Girard Coal Co. v. Wiggins, 52 Ill. App. 69.....	184, 319
Glibas v. Spring Valley Coal Co., 159 Ill. App. 86.....	296, 307, 315, 336
Grimm v. Donk Bros. Coal & Coke Co., 161 Ill. App. 101.....	264, 267, 305
Gruber v. La Salle County Carbon Coal Co., 150 Ill. App. 427.....	329
Gruenendahl v. Consolidated Coal Co., 108 Ill. App. 644.....	257, 321
Guthrie v. Empire Coal Co., 142 Ill. App. 332.....	270, 331
Guthrie v. Empire Coal Co., 180 Ill. App. 530.....	270, 319, 321, 332

H

Hackart v. Decatur Coal Co., 243 Ill. 40, 90 N. E. 257.....	271, 273, 275, 315
Hackart v. Decatur Coal Co., 149 Ill. App. 661.....	273
Hakanson v. LaSalle County Carbon Coal Co., 265 Ill., 165, 166 N. E., 617.....	251, 253
Hakanson v. La Salle County Carbon Coal Co., 168 Ill. App. 147.....	250, 251, 252, 253, 262
Halberg v. Citizen's Coal Min. Co., 149 Ill. App. 412.....	252, 280, 311, 341
Hamilton v. Spring Valley Coal Co., 149 Ill. App. 19.....	263, 305, 335, 336
Hamilton v. State, 102 Ill. 367.....	137, 140, 173, 186
Harding v. People, 160 Ill. 429, 43 N. E. 624.....	108, 109, 111, 329, 332
Harmening v. Henrietta Coal Co., 149 Ill. App. 387.....	340
Hart v. Penwell Coal Min. Co., 146 Ill. App. 155.....	185, 323, 333, 339
Havron v. Shoal Creek Coal Co., 184 Ill. App. 117.....	247, 257, 259, 262, 336
Haywood v. Dering Coal Co., 145 Ill. App. 506.....	290, 322, 340
Henderson v. Moweaqua Min., etc., Co., 145 Ill. App. 627.....	319
Henrietta Coal Co. v. Campbell, 211 Ill. 216, 71 N. E. 863.....	336
Henrietta Coal Co. v. Martin, 221 Ill. 460, 77 N. E. 902.....	258, 260, 261, 276, 277, 283, 292, 294, 296, 320, 331, 332, 333, 334, 341
Hickey v. Springfield Coal Min. Co., 149 Ill. App. 453.....	265, 340
Himrod Coal Co. v. Adack, 94 Ill. App. 1.....	309, 332
Himrod Coal Co. v. Clark, 197 Ill. 514, 64 N. E. 282.....	257, 332
Himrod Coal Co. v. Clingan, 114 Ill. App. 568.....	256, 261, 269
Himrod Coal Co. v. Schrooth, 91 Ill. App. 234.....	138, 140, 184, 255, 309
Himrod Coal Co. v. Stevens, 208 Ill. 115, 67 N. E. 389.....	278, 279, 280, 281
Himrod Coal Co. v. Stevens, 104 Ill. App. 639.....	278, 279, 280, 281
Hollingshead v. Wabash Coal Co., 142 Ill. App. 641.....	174, 181, 288, 294, 299, 304
Hollingsworth v. Chicago & Carterville Coal Co., 243 Ill. 98, 90 N. E. 276.....	303, 304, 326, 378, 379
Hollow v. Wasson Coal Co., 186 Ill. App. 512.....	339
Hoover v. Empire Coal Co., 149 Ill. App. 288.....	323, 334, 335
Hougland v. Avery Coal & Mining Co., 246 Ill. 609, 93 N. E. 40.....	254, 308, 304, 309, 328, 332, 333, 379
Hougland v. Avery Coal Min. Co., 152 Ill. App. 573.....	316, 321, 332
Huchett v. Williamson County Coal Co., 188 Ill. App. 321.....	335

I

Illinois Collieries Co. v. Davis, 137 Ill. App. 15.....	137, 261, 304, 314, 332, 334, 379
Illinois Fuel Co. v. Parsons, 38 Ill. App. 182.....	177, 319, 327, 341
Illinois Midland Coal Co. v. Industrial Board, etc., 277 Ill. 333, 115 N. E. 627.....	435, 436
Illinois Steel Co. v. Olste, 116 Ill. App. 303.....	266
Illinois Third Vein Coal Co. v. Cioni, 215 Ill. 583, 74 N. E. 751.....	178, 265, 262, 337

J

Jacobs v. Madison Coal Corp. 165 Ill. App. 444.....	285, 290, 308, 318, 338
Jenkins v. LaSalle County Carbon Coal Co., 182 Ill. App. 36.....	309, 340
Jones v. People, 110 Ill. 590.....	336, 337
Jones v. People, 113 Ill. 584.....	338
Joseph Taylor Coal Co. v. Dawes. See Taylor Coal Co. v. Dawes.	

TABLE OF ILLINOIS CASES.

505

	Page.
Junction Min. Co. v. Ench, 111 Ill. App. 346.....	256, 286, 298, 335
Jupiter Coal Min. Co. v. Mercer, 84 Ill. App. 96.....	306, 311, 337

K

Kalnaki v. Williamson County Coal Co., 263 Ill. 257, 104 N. E. 1097.....	302
Karkowski v. LaSalle County Carbon Coal Co. 248 Ill. 185, 98 N. E. 780.....	278, 279, 280, 281, 306
Karkowski v. LaSalle County Carbon Coal Co., 164 Ill. App. 399.....	256, 278, 279, 280, 316, 331
Kean v. Jones Bros. Coal & Min. Co., 147 Ill. App. 319.....	285, 293, 316
Kedes v. Christian County Coal Co., 140 Ill. App. 434.....	276, 290
Keller v. Chicago-Wilmington & Vermilion Coal Co., 184 Ill. App. 248.....	284, 321, 330
Kellyville Coal Co. v. Brusas, 228 Ill. 595, 79 N. E. 309.....	170, 274, 282, 290, 294, 295, 300, 301, 320
Kellyville Coal Co. v. Brusas, 125 Ill. App. 464.....	185, 294, 295, 300, 323, 325
Kellyville Coal Co. v. Harrier, 207 Ill. 624, 69 N. E. 927.....	107, 392
Kellyville Coal Co. v. Hill, 87 Ill. App. 424.....	137, 184, 254
Kellyville Coal Co. v. Petraytis, 195 Ill. 215, 63 N. E. 94.....	324
Kellyville Coal Co. v. Petraytis, 96 Ill. App. 635.....	175, 186, 324
Kellyville Coal Co. v. Strine, 217 Ill. 516, 75 N. E. 875.....	3, 167, 170, 179, 180, 181, 182, 290, 297, 271, 274, 275, 283, 290, 296, 299, 305, 308, 312, 320, 322, 331, 332, 334, 335, 338, 340
Kellyville Coal Co. v. Strine, 117 Ill. App. 115.....	2, 170, 182, 249, 254, 255, 275, 306, 309, 310, 331, 341, 342
Kellyville Coal Co. v. Yahuka, 94 Ill. App. 74.....	137, 175, 176, 179, 271, 272, 309
Kennedy v. Chicago & Carterville Coal Co., 180 Ill. App. 42.....	257
Kennedy v. Chicago & Carterville Coal Co., 188 Ill. App. 355.....	339
Kepler v. Applegate & Lewis Coal Co., 153 Ill. App. 582.....	250, 268, 269
Kerens-Donnewald Coal Co. v. Industrial Board, etc., 277 Ill. 35, 115 N. E. 225.....	434, 436
Kilduff v. Consolidated Coal Co., 255 Ill. 617, 99 N. E. 783.....	300
Kilduff v. Consolidated Coal Co., 164 Ill. App. 194.....	180, 182, 298, 310, 332
King v. DeCamp Coal Min. Co., 161 Ill. App. 208.....	278, 310
Kirchner v. Shoal Creek Coal Co., 162 Ill. App. 52.....	179, 180, 182, 332
Krisman v. Johnston City & Big Muddy Coal & Iron Co., 190 Ill. App. 612.....	431, 432
Kulvie v. Bunsen Coal Co., 253 Ill. 398, 97 N. E. 688.....	67, 102, 179, 182, 185, 282, 303, 304, 324, 325, 379
Kulvie v. Bunsen Coal Co., 161 Ill. App. 617.....	67, 103, 325, 326, 327

L

Layher v. Chicago-Sandoval Coal Co., 179 Ill. App. 476.....	306, 306, 317, 318, 322, 330
Layman v. Penwell Min. Co., 142 Ill. App. 580.....	299, 312
LeGru v. Penwell Coal Co., 149 Ill. App. 555.....	291, 293, 338, 339
Leverich v. Danville Collieries Coal Co., 193 Ill. App. 627.....	284, 288
Litchfield Coal Co. v. Taylor, 81 Ill. 500.....	138, 139, 140, 180, 184, 323, 333, 337
Litchfield Min. & Power Co. v. Beanblossom, 133 Ill. App. 122.....	307
Loescher v. Consolidated Coal Co., 259 Ill. 126, 102 N. E. 196.....	138
Loescher v. Consolidated Coal Co., 173 Ill. App. 526.....	335
Loftus v. Illinois Midland Coal Co., 181 Ill. App. 197.....	308, 309, 310, 340
Loftus v. Illinois Midland Coal Co., 193 Ill. App. 454.....	303, 309, 340
Lolli v. Spring Valley Coal Co., 193 Ill. App. 224.....	288, 321
Loose v. People, 11 Ill. App. 445.....	169, 172, 173
Lumaghi v. Voytilla, 101 Ill. App. 112.....	252, 266

M

Madison Coal Co. v. Hayes, 215 Ill. 625, 74 N. E. 755.....	279, 280, 281
Madison Coal Co. v. Hayes, 116 Ill. App. 94.....	278, 279, 280
Magnani v. Spring Valley Coal Co., 193 Ill. App. 107.....	287, 284
Major, In re, 134 Ill. 19, 24 N. E. 973.....	344, 345
Maplewood Coal Co., In re, 213 Ill. 283, 72 N. E. 786.....	324, 344, 345
Maplewood Coal Co. v. Graham, 134 Ill. App. 277.....	308, 331
Marquette Third Vein Coal Co. v. Allison, 132 Ill. App. 221.....	283, 294, 331
Marquette Third Vein Coal Co. v. Dialle, 206 Ill. 116, 70 N. E. 17.....	179, 296, 301, 309, 319, 320, 331
Marquette Third Vein Coal Co. v. Dialle, 110 Ill. App. 684.....	305, 307, 309, 318, 319
Marriage v. Electric Coal Co., 188 Ill. App. 142.....	257, 340
Mattingly v. O'Gara Coal Co., 186 Ill. App. 591.....	339
McCarthy v. Spring Valley Coal Co., 233 Ill. 473, 83 N. E. 957.....	254, 288, 326
McCarthy v. Spring Valley Coal Co., 149 Ill. App. 275.....	332
McCray v. Moweaqua Coal Min., etc., Co., 149 Ill. App. 565.....	316, 317, 323
McFadden v. St. Paul Coal Co., 263 Ill. 441, 105 N. E. 314.....	323, 324, 325, 341

	Page.
McFadden v. St. Paul Coal Co., 188 Ill. App. 36.....	189, 200, 226, 237, 262
McGuire v. North Breese Coal & Min. Co., 179 Ill. App. 598.....	260, 271
McKissick v. O'Gara Coal Co., 186 Ill. App. 511.....	336
McMurray v. Peabody Coal Co. — Ill. —, 118 N. E. 20.....	436
Mengelkamp v. Consolidated Coal Co., 269 Ill. 305, 102 N. E. 756.....	248, 262, 263, 267, 269, 297, 300, 327, 328, 330, 331
Mengelkamp v. Consolidated Coal Co., 173 Ill. App. 376.....	2, 4, 243, 262, 266, 267, 268, 269, 291, 298, 277, 318
Merlo v. Johnston City & Big Muddy Coal & C. Co., 259 Ill. 228, 191 N. E. 528.....	260, 262, 324, 327, 328, 330
Merlo v. Johnston City & Big Muddy Coal & C. Co., 173 Ill. App. 428.....	264, 277, 298, 299, 334
Mertens v. Southern Coal & Min. Co., 235 Ill. 540, 85 N. E. 742.....	3, 106, 206, 258, 268, 291, 298, 299, 312, 325, 327, 334, 341
Mertens v. Southern Coal & Min. Co., 140 Ill. App. 199.....	260, 269, 322
Miller v. Kelly Coal Co., 299 Ill. 685, 88 N. E. 198.....	314
Miller v. Kelly Coal Co., 126 Ill. App. 462.....	360, 312
Millett v. People, 117 Ill. 294, 7 N. E. 294.....	3, 4, 169, 311, 129, 366, 368, 369
Missouri & Illinois Coal Co. v. Schwalb, 74 Ill. App. 567.....	164, 306, 340, 343, 346
Missouri & Illinois Coal Co. v. Schwalb, 77 Ill. App. 583.....	170, 306, 312, 316, 341
Missouri Mal. Iron Co. v. Dillon, 208 Ill. 145, 69 N. E. 121.....	180
Monmouth Min., etc., Co. v. Begnier, 49 Ill. App. 396.....	186, 196
Moore v. Centralia Coal Co., 140 Ill. App. 291.....	180, 273, 305, 306, 315, 316
Moore v. Dering Coal Co., 242 Ill. 84, 89 N. E. 674.....	250, 253, 262
Moore v. Dering Coal Co., 147 Ill. App. 96.....	173, 249, 269, 264, 262, 263, 262
Morris v. O'Gara Coal Co., 181 Ill. App. 309.....	268, 269, 326
Mount Olive & Staunton Coal Co. v. Herbeck, 199 Ill. 39, 69 N. E. 196.....	127, 175
Mount Olive & Staunton Coal Co. v. Herbeck, 92 Ill. App. 461.....	127, 176, 360
Mount Olive & Staunton Coal Co. v. Rademacher, 190 Ill. 598, 60 N. E. 889.....	127, 176, 271, 272, 308, 309, 322
Muddy Valley Mining, etc., Co. v. Phillips, 29 Ill. App. 376.....	170, 171, 179, 180
Munier v. Chicago & Cartersville Coal Co., 180 Ill. App. 114.....	274, 275, 286
Muren Coal & Lee Co. v. Howell, 107 Ill. App. 1.....	268, 269
Mygatt v. Southern Coal & Min. Co., 189 Ill. App. 150.....	2, 3, 252, 266, 267, 268, 267, 262, 320, 326

N

New Virginia Coal Co. v. Gower, 119 Ill. App. 1.....	254, 255, 269
Niantic Coal Min. Co. v. Leonard, 126 Ill. 216, 19 N. E. 216.....	176, 264, 336
Niantic Coal Min. Co. v. Leonard, 25 Ill. App. 95.....	174, 176, 177, 264, 336
Noonan v. Saline County Coal Co., 173 Ill. App. 541.....	268, 269, 308, 323

O

Odin Coal Co. v. Danman, 185 Ill. 412, 57 N. E. 192.....	183, 174, 176, 178, 179, 180, 182, 194, 260, 266, 266, 306, 310, 320, 321, 326, 326
Odin Coal Co. v. Deaman, 84 Ill. App. 190.....	127, 130, 174, 179, 180, 194
Odin Coal Co. v. Tadlock, 216 Ill. 624, 75 N. E. 332.....	261, 306
Odorissi v. Southern Coal Co., 151 Ill. App. 398.....	316, 341
O'Fallon Coal Min. Co. v. Laquet, 198 Ill. 125, 64 N. E. 767.....	162, 272, 326, 331
O'Fallon Coal & Min. Co. v. Laquet, 89 Ill. App. 12.....	272, 326, 326
Olson v. Kelly Coal Co., 236 Ill. 502, 86 N. E. 88.....	250, 259, 269, 268, 269, 304, 326, 333, 334, 339, 340
Olson v. Kelly Coal Co., 143 Ill. App. 269.....	240, 294
Orlee v. Bunsen Coal Co., 171 Ill. App. 175.....	170, 300, 304, 302
Owsianny v. Saline County Coal Co., 183 Ill. App. 518.....	336

P

Paletta v. Illinois Zinc Co., 267 Ill. 11, 100 N. E. 218.....	200, 208
Paletta v. Illinois Zinc Co., 153 Ill. App. 506.....	203, 205, 310
Pana Coal Co. v. Becker, 130 Ill. App. 40.....	276, 277
Pareba v. Illinois Midland Coal Co., 156 Ill. App. 140.....	276, 269
Parish v. Black Diamond Coal Co., 143 Ill. App. 118.....	293
Pate v. Gus Blair—Big Muddy Coal Co., 252 Ill. 198, 96 N. E. 849.....	4, 267, 264, 255, 266, 267, 267, 313
Pate v. Gus Blair—Big Muddy Coal Co., 158 Ill. App. 578.....	250, 251, 264, 337
Pawnee Coal Co. v. Royce, 184 Ill. 402, 56 N. E. 621.....	121, 122, 124, 178, 181, 182, 321, 333
Pawnee Coal Co. v. Royce, 79 Ill. App. 469.....	178, 172, 174, 178, 181
Peabody Coal Co. v. Industrial Board etc., — Ill. —, 117 N. E. 963.....	327
Peables v. O'Gara Coal Co., 299 Ill. 370, 88 N. E. 166.....	269, 266, 269, 304, 269, 310, 321, 324, 327
People v. Bell, 237 Ill. 322, 86 N. E. 592.....	343, 345
People v. Butler St. Foundry & Iron Co., 201 Ill. 226, 66 N. E. 342.....	122, 123
People v. Cannon, 186 Ill. App. 448.....	262, 263

TABLE OF ILLINOIS CASES.

507

	Page.
People v. Evans, 247 Ill. 547, 93 N. E. 388.....	101, 102
People v. Kolb Coal Co., 151 Ill. App. 469.....	249, 250
People v. Leiter, 143 Ill. App. 250.....	258, 259, 260
People v. O'Gara Coal Co., 231 Ill. 172, 83 N. E. 140.....	246
People v. Solomon, 265 Ill. 32, 106 N. E. 488.....	111, 112, 113
Pettinger & Davis Mfn. Co. v. Gettleman, 126 Ill. App. 549.....	310, 311
Petton v. Consolidated Coal Co., etc., 183 Ill. App. 567.....	268
Piazzi v. Kerens-Donewald Coal Co., 263 Ill. 30, 104 N. E. 200.....	285, 288, 292, 293, 294, 301, 331
Piazzi v. Kerens-Donewald Coal Co., 179 Ill. App. 540.....	288, 290, 308, 330, 341
Pierce v. Decatur Coal Co., 158 Ill. App. 192.....	286
Price v. Clover Leaf Coal Min. Co., 183 Ill. App. 27.....	339, 421, 432, 433
Prnette v. O'Gara Coal Co., 166 Ill. App. 470.....	250, 252
Purtell v. Philadelphia Coal Co., 256 Ill. 110, 99 N. E. 899.....	319

Q

Quincy Coal Co. v. Hood, 77 Ill. 68.....	170
--	-----

R

Ramsey v. People, 142 Ill. 380, 32 N. E. 354.....	107, 109, 389, 390, 392
Reinecke v. People, 16 Ill. App. 241.....	386, 387, 388
Riverton Coal Co. v. Shepherd, 207 Ill. 395, 69 N. E. 921.....	331
Riverton Coal Co. v. Shepherd, 111 Ill. App. 294.....	305, 332
Roach v. Wilks Coal Min. Co., 183 Ill. App. 577.....	310, 328, 330, 332
Robertson v. Donk Bros. Coal & Coke Co., 238 Ill. 344, 87 N. E. 373.....	267, 268, 315
Robertson v. Donk Bros. Coal & Coke Co., 143 Ill. App. 391.....	2, 267, 315
Rogers v. St. Louis-Carterville Coal Co., 264 Ill. 104, 98 N. E. 270.....	2, 3, 243, 252, 259, 268, 287, 300
Romani v. Shoal Creek Coal Co., 191 Ill. App. 521.....	308, 323, 329
Romani v. Shoal Creek Coal Co., 271 Ill. 360, 111 N. E. 88.....	341
Romeo v. Western Coal & Min. Co., 137 Ill. App. 67.....	300, 302, 327
Rosan v. Big Muddy Coal & Iron Co., 128 Ill. App. 128.....	252, 261, 311
Royce v. Pawnee Coal Co. (error). See Pawnee Coal Co. v. Royce.	
Russell v. O'Gara Coal Co., 188 Ill. App. 323.....	272, 275, 325

S

Salerno v. Missouri & Illinois Coal Co., 186 Ill. App. 343.....	305, 306, 310, 339
Sangamon Coal Min. Co. v. Wiggerhaus, 123 Ill. 279, 13 N. E. 279.....	139, 174, 261, 308
Sangamon Coal Min. Co. v. Wiggerhaus, 25 Ill. App. 77.....	174
Schlepp v. McLean Co. Coal Co., 235 Ill. 630, 85 N. E. 916.....	270, 310
Schlepp v. McLean County Coal Co., 128 Ill. App. 1.....	269, 313
Schultz v. Burnwell Coal Co., 180 Ill. App. 693.....	299, 313, 322, 330, 338
Seghetti v. Barry Coal Co., 186 Ill. App. 263.....	103, 303, 317, 319, 336
Sellers v. Peabody Coal Co., 173 Ill. App. 220.....	295, 302, 303
Sheppard v. Marquette Third Vein Coal Co., 164 Ill. App. 466.....	255, 310, 312
Shimmers v. Royal Coal & Min. Co., 188 Ill. App. 335.....	322, 325, 328, 329, 330
Sholl v. German Coal Co., 118 Ill. 427, 10 N. E. 199.....	119
Sholl v. People, 83 Ill. 129.....	136
Sholl v. People, 194 Ill. 24, 61 N. E. 1122.....	344, 345
Shook v. Majestic Coal & Coke Co., 166 Ill. App. 586.....	336
Simmons Coal Co. v. Board, etc., — Ill. —, 118 N. E. 758.....	344
Smith v. Consolidated Coal Co., 183 Ill. App. 672.....	251, 267
Smith v. Illinois Collieries Co., 155 Ill. App. 148.....	290, 301, 302, 308, 339, 341
Smith v. Moffat Coal Co., 151 Ill. App. 362.....	3, 281
Smith, Sohr Coal Min. Co. v. Industrial Board, etc., 279 Ill. 88, 116 N. E. 656.....	435
Snodgrass v. Chicago-Sandoval Coal Co., 183 Ill. App. 442.....	312
Souleyret v. O'Gara Coal Co., 181 Ill. App. 60.....	300, 306
Southern Coal & Min. Co. v. Hopp, 133 Ill. App. 239.....	176, 274, 303, 304, 309, 379
Springfield Coal Min. Co. v. Gedutis, 227 Ill. 9, 81 N. E. 9.....	175, 271
Springfield Coal Min. Co. v. Gedutis, 127 Ill. App. 327.....	254, 272, 274, 306
Springside Coal Min. Co. v. Grogan, 53 Ill. App. 60.....	170, 173, 177, 181, 184, 252
Spring Valley Coal Co. v. Greig, 226 Ill. 511, 80 N. E. 1042.....	111, 179, 180, 250, 251, 253, 254, 255, 286, 287, 313
Spring Valley Coal Co. v. Greig, 129 Ill. App. 386.....	111, 250, 255, 287
Spring Valley Coal Co. v. McCarthy, 136 Ill. App. 473.....	257
Spring Valley Coal Co. v. Patting, 210 Ill. 342, 71 N. E. 371.....	182, 265, 267, 282, 331, 337
Spring Valley Coal Co. v. Patting, 112 Ill. App. 4.....	182, 267
Spring Valley Coal Co. v. Rowatt, 196 Ill. 156, 63 N. E. 649.....	178, 179, 182, 263, 331, 332

	Page.
Spring Valley Coal Co. v. Rowatt, 96 Ill. App. 248.....	171, 172, 177, 178, 181, 253
Stanhaus v. Paradise Coal & Coke Co., 109 Ill. App. 75.....	292, 294, 299, 310, 340
Starne v. People, 222 Ill. 189 p., 78 N. E. 61.....	111, 112, 118
Staunton Coal Co. v. Bubb, 119 Ill. App. 278.....	263, 261
Stevenson v. Avery Coal & Min. Co., 143 Ill. App. 307.....	310, 321, 332, 379
Stevenson v. Avery Coal & Min. Co., 152 Ill. App. 565.....	332, 379
Struthers v. People, 116 Ill. App. 481.....	140, 282, 307, 318, 319
Sunnyside Coal Co. v. Center, 100 Ill. App. 546.....	179, 182
Swengel v. Illinois Third Vein Coal Co., 154 Ill. App. 409.....	181
Swengel v. LaSalle County Carbon Coal Co., 182 Ill. App. 623.....	251, 252, 262, 325, 334
Swinosynski v. Kelly Coal Co., 146 Ill. App. 120.....	273, 317

T

Taylor Coal Co. v. Dawes, 220 Ill. 145, 77 N. E. 131.....	182, 290, 261, 265, 308, 315, 338
Taylor Coal Co. v. Dawes, 122 Ill. App. 389.....	254, 255, 261, 290, 305, 315, 331, 337, 338
Thompson v. Dering Coal Co., 158 Ill. App. 289.....	275
Thompson v. O'Gara Coal Co., 161 Ill. App. 39.....	176, 264, 265, 266
Tomasl v. Donk Bros. Coal & Coke Co., 257 Ill. 70, 100 N. E. 353.....	285, 331, 341, 342, 380
Tomasl v. Donk Bros. Coal & Coke Co., 169 Ill. App. 47.....	285, 341, 342, 380
Traylor v. Barry, 96 Ill. App. 644.....	105
Turner v. Manufacturers & Consumers Coal Co., 161 Ill. App. 534.....	277, 289, 380
Tygett v. Sunnyside Coal Co., 140 Ill. App. 77.....	170, 282, 294, 295, 300

V

Vaughn v. O'Gara Coal Co., 173 Ill. App. 258.....	175, 271, 273, 276, 277, 288, 306, 308
Vindas v. Dering Coal Co., 145 Ill. App. 528.....	276, 277

W

Waschow v. Kelly Coal Co., 245 Ill. 516, 92 N. E. 303.....	313, 314, 334, 337, 341
Waschow v. Kelly Coal Co., 151 Ill. App. 41.....	340
Wells v. Lumaghi Coal Co., 183 Ill. App. 404.....	256, 283, 291, 296, 297, 299, 322, 327, 328, 330
Wentzinski v. Madison Coal Co., ——— Ill. ———, 118 N. E. 435.....	282, 305, 432
Wesley City Coal Co. v. Healer, 84 Ill. 126.....	138, 335
Western Anthracite Coal & Coke Co. v. Beaver, 192 Ill. 333, 61 N. E. 335.....	182, 271, 274, 276, 331, 332, 333
Western Anthracite Coal & Coke Co. v. Beaver, 95 Ill. App. 65.....	175, 180, 182, 271, 333
Westville Coal Co. v. Schwartz, 75 Ill. App. 468.....	260
Whitebreast Fuel Co. v. People, 175 Ill. 51, 51 N. E. 853.....	107, 109, 110, 286, 387, 389, 390, 392
Wilkerson v. Willis Coal & Min. Co., 158 Ill. App. 620.....	269, 308, 331, 334
Wilkins v. Madison Coal Corp., 188 Ill. App. 416.....	289
Williams v. Orion Coal Co., 161 Ill. App. 65.....	300, 310
Willis Coal & Min. Co. v. Grizzell, 198 Ill. 313, 65 N. E. 74.....	323, 324, 325, 331
Willis Coal & Min. Co. v. Grizzell, 100 Ill. App. 480.....	179, 180, 182, 185, 266, 310, 324, 341
Wilmington & Springfield Coal Co. v. Sloan, 225 Ill. 467, 80 N. E. 265.....	261, 309
Wilmington & Springfield Coal Co. v. Sloan, 127 Ill. App. 218.....	305
Wilson v. Danville Collieries Coal Co., 264 Ill. 143, 106 N. E. 194.....	285, 292, 296, 301, 333, 341
Wilson v. Danville Collieries Coal Co., 171 Ill. App. 65.....	292, 294, 295, 300, 301
Wilson v. Danville Collieries Coal Co., 184 Ill. App. 180.....	292, 301
Wullner v. Smith-Lehr Coal Co., 145 Ill. App. 486.....	290, 339
Wyzard v. Vivien Collieries Co., 184 Ill. App. 199.....	311

Y

Yanlonis v. Spring Valley Coal Co., 185 Ill. App. 563.....	276, 277, 336
--	---------------

TABLE OF FOREIGN CASES.

	Page.
A	
Adams v. Kansas & Texas Coal Co., 85 Mo. App. 45.....	335
B	
Bodell v. Brazil Block Coal Co., 26 Ind. App. 554.....	139
Brazil Block Coal Co. v. Hotel, 192 Fed. 108.....	272, 276, 338
Broad Top R. Co. v. Decker, 84 Pa. St. 419.....	184
C	
Chicago-Coulterville Coal Co. v. Fidelity, etc., Co., 130 Fed. 957.....	253, 306, 331
Collins Coal Co. v. Hadley, 38 Ind. App. 637.....	184
Colorado Coal & Min. Co. v. Lamb, 6 Colo. App. 255, 40 Pac. 251.....	300
Commonwealth v. Plymouth, 233 Pa. St. 141.....	248, 249
D	
Durant v. Lexington Coal Co., 97 Mo. 62.....	139
Durkin v. Kingston Coal Co., 171 Pa. 193.....	3, 261, 309
E	
Edgewood Railroad Co.'s App., 79 Pa. St. 257.....	119
F	
Fulton v. Wilmington Star Min. Co., 133 Federal 193.....	3, 248, 249, 261, 306, 306, 33
H	
Hall v. Johnson, L. J. Ex. 222.....	183
Hochstetler v. Mosier Coal & Min. Co., 8 Ind. App. 442.....	323, 328
I	
Inspiration Consol. Copper Co. v. Mendes, — Ariz. —, 166 Pac. 278.....	429
J	
Jones v. Wood, 9 Circ. Ct. 560 (Ohio)	345
K	
Kansas Natural Gas Co. v. Board of Commerce, 75 Kan. 335, 89 Pacific 250.....	345
Kitchen v. Smith, 101 Pa. St. 452.....	345
M	
Madison Coal Corporation v. Stullken, 226 Federal 307.....	316, 337
Maule Coal Co. v. Partenheimer, 155 Ind. 100, 55 N. E. 751, 57 N. E. 716.....	139
Morgan, in re, 26 Colorado, 415.....	111
Morris Run Coal Co. v. Barkley Coal Co., 68 Pa. St. 173.....	121
P	
Princeton Coal Min. Co. v. Lawrence, 176 Ind. 469, 95 N. E. 423, 96 N. E. 387.....	307
S	
Springfield Coal Min. Co. v. Gordon, 147 Federal 690.....	266
Spring Valley Coal Co. v. Patting, 86 Fed. 433.....	265
State v. South Pennsylvania Ore Co., 42 W. Va. 80.....	345
St. Louis Consolidated Coal Co. v. Illinois, 185 U. S. 203.....	168, 169, 170, 171
Sugar Valley Coal Co. v. Drake, — Ind. App. —, 117 N. E. 937.....	436

T

	Page
Troughgear v. Lower Vain Coal Co., 62 Iowa 576, 17 N. W., 775.....	170, 183

U

United States v. Jellico Mountain Coke & Coal Co., 47 Fed. 432.....	171
---	-----

W

Williams v. Thacker Coal & Coke Co., 44 W. Va. 500, 30 S. E. 127.....	3, 361, 39
Wilmington Star Min. Co. v. Fulton, 205 U. S. 60.....	248, 249, 258, 351
Wojtylak v. Kansas & Texas Coal Co., 188 Mo. 260, 87 S. W. 506.....	274, 333

INDEX.

A

- ACTIONS.** See also *Assumption of risk, Contributory negligence, Damages, Miners, Mining operations, Mining statutes, Negligence, Wrongful death.*
- abstracts of decisions relating to court's instructions, 322.
 - admissibility of X-ray photograph of injury, 321, 322.
 - all damages recovered in single action, 341, 342.
 - avowment as to exercise of care required, 319.
 - burden of proof as to violation of statute, 319.
 - by injured miner, abstracts of decisions relating to, 319, 327.
 - pleading and proof, instances, 319-27.
 - cause of motor being thrown from track, question of fact, 329.
 - not affected by repeal of statute, 330.
 - saved, 329, 330.
 - change in statute as to parties, 327, 328.
 - competency of mine examiner's report as to violation of statute, 322.
 - condition and operation of mine shown by expert evidence, 328, 329.
 - condition of mine where accident occurred, question of fact, 330.
 - contributory negligence of shot firer no defense, 320.
 - damages, single recovery, 340, 341, 342.
 - death of miner, administrator not entitled to sue, 324.
 - amendment by substituting different parties, 324.
 - to complaint barred, 326.
 - authority to compromise suit, 325.
 - change in statute as to parties entitled to recover, 327.
 - statutory right to sue, 325.
 - damages, persons entitled to, 323.
 - proof of means of support, 323.
 - defeated action for violation of statute no defense to action for negligence, 326.
 - defense, miner employed as shot firer, 325.
 - dependence of widow, elements of damages, 326, 327.
 - dependents' right of action, 323, 324.
 - difference between act of 1899 and of 1911 as to parties, 327, 328.
 - elements of damages, 325.
 - error as to statute of limitation waived, 323.
 - father's and mother's right of action, 323.
 - limitation of, 329.
 - no retroactive effect, 329.
 - measure of damages, 325, 326.
 - next of kin's right of action, 323, 324.
 - nondependent can not recover, 324.
 - nonresident alien dependent may sue, 324.
 - parties, change in statute, 327, 328.
 - pecuniary loss of widow and next of kin, measure of damages, 327.
 - personal representatives as plaintiffs under act of 1911, 327, 328.
 - power of legislature to name parties and distribute damages, 323.
 - proof of earning capacity or financial condition of dependents, 326.
 - dependence, 326, 327.
 - of wife and children, 326.
 - support, widow's right to testify, 324.
 - sufficient to justify recovery, 326.
 - provisions of old statutes continued, 329.
 - recovery for benefit of widow, next of kin, and dependents, 328.
 - not a penalty but damages, 326.
 - right accrued under former act continues, 329.
 - of action in widow, lineal heirs, or adopted children, 323, 324.
 - to sue, 323, 324, 325.
 - for action accruing under law of 1899, 328.
 - in personal representatives, 327, 328.
 - survival of actions, 329, 330.
 - time for bringing, limitations, 324.

ACTIONS—Continued.

- death of miner, violation of statute, defense, 322.
 - widow and children considered in assessing damages, 325, 326.
 - widow's right of action, 323, 324, 325.
 - to testify, 324.
 - shotfirer, effect of contributory negligence, operator's violation of statute, 380, 379, 380.
 - proof of prior condition of entry admissible, 380.
 - subsequent condition of entry inadmissible, 380.
 - statement of mine examiner inadmissible 379.
- distinction between for negligence and violation of statutes, 319-327.
- expert evidence, abstracts of decisions relating to, 338, 339.
 - admissibility, 338, 339.
 - to show safe condition, 338.
 - inadmissible to show safe or dangerous condition, 338.
 - instances of inadmissibility, 338, 339.
 - to show effect of firing of shots upon props and surrounding conditions, 338.
 - method of propping roof, 338.
 - mining operations, 338.
- failure of operator to furnish props, contributory negligence of miner immaterial, 333.
 - question of fact, 339.
 - to make refuge places as cause of injury, question of fact, 340.
 - proximate cause of injury 340.
 - question of fact, 340.
- guilty knowledge shown by proof of similar acts, 337.
- injuries received while cleaning up fall, recovery, 320.
 - working under direction of mine manager, recovery, 320.
- X-ray photographs of, admissible in evidence, 322.
- instructions as to effect of contributory negligence of miner, 322.
 - of court, instances, 322.
 - in language of statute, 322.
 - as to operator's duty to furnish props, 338.
 - must be applicable to the facts proved, 322.
- legal status of, not affected by repeal of statute, 330.
- limitation of, statute governing, 329.
- miner entering mine before dangerous conditions removed, recovery, 320.
- miner's right to recover for injuries received while making dangerous place safe, 328.
- negligence of operator, not affected by workmen's compensation act, 403.
- one action for damages for death of miner, 323, 324.
- pending cases not affected by repeal of statute, 330.
- place and nature of miner's work at time of injury, question of fact, 339.
- proof as to operator's failure to report accident, immaterial, 320.
 - of similar acts, 337.
 - to show guilty knowledge, 337.
 - questions of fact, 340, 341.
 - to sustain for breach of statutory duty, 319.
- questions of fact, abstracts of decisions relating to, 339, 340, 341.
 - instances, 339, 340, 341.
- record and report of mine examiner as proof of violation of statute, 320.
 - of dangerous conditions, miner's attempt to read, 321.
- recovery by miner for injury received while cleaning up a fall, 320.
 - for death of miner, parties, 323, 324, 325.
 - injuries received while repairing dangerous conditions, 328.
- repeal of statute does not take away right of, 330.
- right of accruing under former act continues, 329, 330.
 - not affected by repeal of statute, 330.
- rights determined under law at time of injury, 322.
- statute at time of injury to determine rights, 322.
- suitableness and sufficiency of props, question of fact, 340.
- survival of action, 329, 330.
- violation of statute, civil suit for damages. 319.
 - defenses admissible, 321.
 - degrees of proof required, 320.
 - effect of miner's contributory negligence, 332.
 - failure to ventilate, acts of fellow servants, 321.
 - proof of dangerous conditions, absence of excuse 321.
 - due care of miner, 332, 333.
 - operator's knowledge of presence of gas unnecessary, 321.
 - proximate cause of injury, question of fact, 340.

ACTIONS—Continued.

- willful violation of statute, question of fact, 339.
- willingness of miner to submit injuries for examination, 321.
- X-ray photographs of injuries admissible in evidence, 322

AGENT.

- See also Mine examiner, Mine inspector, Mine manager, Mining operations, Mining statutes, Vice principal.
- action against, for dereliction of duty not maintainable, 183.
- negligence of, as cause of injury, operator not liable, 178.
- personal liability for violation of statute, 178.
- violation of statute, no recovery, 183.

AIR CURRENTS.

- See Ventilation

AIR SHAFTS.

- See Shafts.

ANNOTATIONS.

- act 1852, 119.
- 1861, 343.
- 1872 and amendatory acts, 136-140.
- 1879 and amendatory acts, 167-180.
- 1883, 386.
- 1885, 390.
- 1887, 390.
- 1891, 106, 107, 108, 121, 301, 302.
- 1896, 105.
- 1897, 109.
- 1899 and amendatory acts, 245-342.
- 1903, 111.
- 1905, 378.
- 1907, 378.
- 1908, 100-103.
- 1911 and amendatory acts, 245-342.
- June 10, 1911, 430.
- 1913, 112, 378.
- June 28, 1913, 430.
- amendatory act 1891, 391.
- 1903, 67, 245-342.
- 1905, 245-342.
- 1907, 245-342.
- 1913, 245-342.
- 1915, 245-342.
- June 28, 1915, 430.

Constitution, 2-4.

- workmen's compensation act, 430.

ANNUAL COAL REPORT.

- See also Reports, State mining board.
- duty of State mining board to make, 76, 83, 89.
- publication of, 76, 83, 89.

APPLIANCES.

- See also Bollers, Doors, Gates, Hoisting and hoisting equipment, Mining machinery, Mining operations, Shafts.
- construction of term, 3.
- inclusion of all physical conditions in mines, 3.
- required for safety in coal mines, 3.

APPROPRIATIONS.

- board of examiners, 50, 51.
- claim of A. Paine, 22.
- Department of Mines and Minerals, 440.
- engineering department at University, 10.
- expenses for Mining Investigation Commission, 443.
- geological and mineralogical survey, 20-27.
- commission, 25, 26, 27.
- geologist's salary, 20.
- instruments used in mines by mine inspectors, 52, 53.
- mine inspectors, expenses and salaries, 50-53.
- rescue station commission, 29, 32.
- miners' examining board, 90, 91, 103.

APPROPRIATIONS—Continued.

Mining Investigating Commission, 443.
 salaries of board of examiners, 51.
 State mining board, 90, 91.

APPROPRIATION OF LAND.

See Eminent domain, Drainage of mines, Mining operations.

ASSUMPTION OF RISK.

See also Contributory negligence, Miners, Mining operations, Mining statutes, Negligence, Workmen's compensation act.
 appreciation of danger, 336.
 continuing work with knowledge of danger is not, 337.
 danger at face of coal, 336.
 from falling coal, 336.
 of mining assumed, actual knowledge of dangerous place in roof, 188.
 dangerous condition, miner making safe, 336.
 defense of, not available in case of violation of statute, 337.
 unavailing in actions for violation of statute, 317.
 where employee elects not to accept compensation, 431.
 distinctions as to assumed risk and contributory negligence not indulged, 337.
 doctrine does not apply to operator's willful violation of statute, 337.
 effect under workmen's compensation act, 434.
 injury, negligence of fellow miner, 183.
 miner's knowledge of danger, 183.
 negligence of employees, not assumed, 337.
 risks assumed by miner, 336.
 not assumed by miner, 337.

B**BLACK POWDER.**

See Explosives, Powder.

BLANKETS.

See also Coal-mine operator, Mining operations, Mining statutes, Stretches.
 number to be furnished by operator, 201, 227.
 operator to furnish, 201, 227.

BLASTING POWDER.

See Explosives.

BOARD OF EXAMINERS.

See Miners' examining board.

BOILERS.

See also Hoisting engineer, Hoisting appliances and machinery, Mining operations.
 boiler house, distance from main shaft, 190.
 location, 190.
 care and management of, 130, 143, 158, 162, 217, 231, 243.
 by engineer required, 195.
 certificate of inspection of, to mine inspector, 130, 143.
 equipment and connection with hoisting apparatus, 191, 217, 231, 243, 243.
 equipped with safety valves, 191, 217, 231, 243.
 examination and inspection, 191, 217, 231, 243.
 failure to inspect as a willful violation of statute, 255.
 fireproof construction of houses for, 190.
 frequency of inspection, 191, 217, 231, 243.
 gauges, adjustment and test, 191, 217, 231, 242.
 attachment to boilers, 191, 217, 231, 242.
 in sight of engineer and fireman, 191, 242.
 to indicate steam pressure, 191, 217, 231, 243.
 hoisting engineer to care for, 195.
 includes pipes and connections, 255.
 inspection of, 191, 217, 231, 243.
 by competent person, 130, 143, 158, 162, 191, 217, 231, 243.
 pipes and connections required, 255.
 management and operation, 130, 143, 158, 162, 191, 217, 231.
 number of inspections required, 130, 143, 158, 162, 191, 217, 231, 243.
 safety valves adjusted, 191, 217, 231, 243.
 required, 130, 143, 158, 162, 191, 217, 231, 243.
 steam and water gauges and valves required, 130, 143, 191, 217, 231, 243, 243.
 pressure shown by valves, 191, 217, 231, 243.
 valves showing steam pressure required, 191, 217, 231, 243.

BOND.

See also County inspector, Mine inspector.
amount of mine inspector's, 75, 82, 88, 144, 149, 154.
conditions of mine inspector's, 75, 82, 88, 144.
mine inspector's approved by governor, 75, 82, 88.
filed with secretary of state, 75, 82, 88.
State mine inspectors required to give, 75, 82, 144.

BORE HOLES.

See also Coal-mine operator, Mining operations, Ventilation.
duty of mine operator as to, 129, 199, 227.
made in advance of working places, 129, 237.
penalty for violating act, 129, 132, 133, 134.
required in mines under certain conditions, 129.
when required, 199.
workings approaching old workings, requirements, 199, 227.

BOTTOM MAN.

See also Mining operations, Mining statutes, Shafts, Top man.
duty to remain at post, 176, 218.
mine manager to see that he is on duty, 224, 237.
must be on duty when miners are hoisted or lowered, 195, 218.
remaining at post after hoisting of coal ceases, 264.

BOYS.

See also Coal-mine operator, Girls, Mining operations, Mining statutes, Minors, Women.
affidavit as to age required, 198, 205, 228.
age for employment, 198, 205, 228.
Limit changed from 14 to 16 years, 281, 282.
construction and purpose of act prohibiting employment, 318, 319.
employment in coal mine, change of age, 281, 282.
prohibited, reasons for, 318, 319.
under 14 years of age not to be employed in mines, 198.
16 years of age not to be employed in mines, 205, 228.

BUREAU OF STATE GEOLOGICAL SURVEY.

See Geological commission, Geological Survey, Geologist

BURYING DEAD MINERS.

See Dead miners, Mine inspectors, Mining corporations.
duties of mining company, 1.

C

CAGES.

See also Coal mines, Hoisting and hoisting equipment, Hoisting engineer, Inspection and examination of mines, Lights, Mine inspector, Mining operations, Mining statutes, Shafts, Signals.
attached to hoisting rope by safety hooks, 214.
attachment of hoisting ropes, 230.
bottom and top man, duties as to hoisting and lowering miners, 200, 218.
care required of mine manager as to, 195, 218.
catches or springs to be furnished, 134, 142, 143, 147, 157, 216, 230.
coal-mine operator to provide, 129, 132, 133, 134, 142, 147, 157.
not to be hoisted while miners are going in and out, 180, 134, 200, 218.
construction of, for hoisting men, 190, 216, 230.
covering required for use in sinking shafts, 214.
cover overhead required, 129, 132, 133, 134, 142, 147, 157, 190, 216, 230.
daily examination by mine manager before miners are lowered, 195.
empty cages for hoisting men at end of shift, 200, 218.
equipment, 189, 216, 230.
for signals, 85, 189.
excessive speed of, liability of operator for injuries caused by, 265.
violation of statute, knowledge of engineer, 318.
failure to properly equip, willful violation of statute, 177, 178, 264.
handhold on required, 189, 216, 230.
frequent examinations by mine manager required, 196.
hoisting and lowering miners by, 200.
indicator on hoisting engine to show position, 191.
inspector's consent as to speed, 200, 218.
iron bars for handholds, 189, 216, 230.
lighted when operated in night time, 200.
materials, timber or tools not to be carried on, 200, 218.
maximum rate of speed when miners are riding in, 200, 218.
miners not to ride on when loaded, 130, 134, 143, 147, 158, 200, 218.
prohibited from riding on self-dumping, 200.

CAGES—Continued.

- notice as to installation of rope, 230.
- number of men permitted to be lowered or hoisted, notice of, 122.
- operated by steam hoisting engine, 190.
- part of equipment of shaft, 189.
- penalty for violating act, 129, 132, 133, 134, 144.
 - provision as to operation, 130, 135, 144.
- protection of person lowered by, 129, 132, 133, 134, 144.
- rate of speed miners may be lowered or hoisted, 192, 200, 218.
- rope attached and socketed at, 230.
- safe construction required, 189, 216, 230.
- safety catches required, 189, 216, 230.
 - devices used with, 134, 142, 143, 147, 187, 189, 216, 220.
- self-dumping, carriage of miners on, 200.
- signals to be given from, 189, 216, 230.
- speed of, when miners are riding in, 192, 200, 218.
- supports for holding cage required, 189, 216, 230.
- top landing support required, 189.
 - man and bottom man required, 218.
 - time for performance of duties, 218.
- use of uncovered cage for hoisting miners, 138, 143, 147, 157.
- violation of provision as to operation, 130, 135, 144, 148, 157.
- willful violation of statute in operation of, liability of operator, 265.

CAP PIECES.

- See Coal-mine operator, Mining operations, Props.

CERTIFICATES.

- See also Examination of miners, Miners, Miners' examining board, State mining board.
- applicant for, must register, 64, 72, 84.
- as evidence of miner's qualifications, 102.
 - to qualifications of miners, 92, 94, 96, 99.
- cancellation of, 65, 70, 74, 81, 86.
- charges preferred before cancellation, 65, 70, 74, 81, 86.
- coal-mine operator to employ certificated persons only, 64, 70, 73, 74, 80.
- conditions for cancellation, 65, 70, 74, 81, 86.
 - employment of miners, 93, 96, 98.
- contents, 64, 69, 73, 80, 85.
 - of record of, 69, 73, 80, 85.
- effect of, 64, 69, 73, 80, 85.
 - and rights under, 64, 69, 73, 80, 85.
- employment of holders of, 64, 69, 70, 73, 74, 80, 86.
 - persons not holding, prohibited, 64, 69, 70, 73, 74, 80, 86.
 - uncertificated mine examiner, time limited, 64, 70, 73, 80, 86.
- examination of applicants for, 63, 68, 69, 71, 72, 73, 79, 80, 84.
- fees for, 65.
- foreign certificate, holder, condition for employment, 64, 69.
- hearing before cancellation, 65, 70, 74, 81, 86.
- holder employed as coal miner, 67.
 - may seek employment as coal miner, 102.
 - not employed as shot firer, 67.
- inspection of record of certificated persons, 64.
- issued by mining board, 64, 69, 73, 80, 85.
 - to applicants above minimum rating, 64, 69, 73, 80, 85.
 - holders of foreign certificates, 64, 69.
 - under signature and seal of mining board, 64, 69, 73, 80, 85.
- miner's certificate not sufficient for shot firer, 102.
- miners must obtain, before employment in mines, 93, 96, 98.
- mining board may cancel, 65, 70, 74, 81, 86.
- notice of charges, 65, 70, 74, 81, 86.
 - hearing before cancellation, 65, 70, 74, 81, 86.
- only holders of, may be employed, 64, 69, 73, 74, 80, 86.
- opportunity for hearing before cancellation, 65, 70, 74, 80, 86.
- permanent registers of certificated persons, 64, 69, 73, 80, 85.
- persons not holding, prohibited from employment, 64, 69, 70, 73, 74, 80, 85, 86.
- proof must be made by original records, 108.
- record of, by mining board, 64, 69, 73, 80, 85.
 - certificated persons kept by Bureau of Labor Statistics, 64.
- rights of holders of, 64, 69, 73, 80, 85.
- unlawful to employ other than certificated persons, 64, 69, 70, 73, 74, 80, 85, 86.

COAL BANKS.

- conviction for trespass on, 58, 59.
- crime to injure, 58, 59.
- penalty for entering upon, without consent of owner, 58.
- trespass on, 58, 59.

COAL CARS.

- See also Engine planes, Entries, Gangways, Haulageways, Lights, Miners, Mining operations, Signals.
- absence of light on immaterial, 271.
- bumpers must extend beyond end of car, 234.
- changing check or device on loaded car crime, 227.
- coupling must be clear of ties and rails, 221, 234.
- equipment, 221, 224.
 - after taking effect of act, 221, 234.
 - application to mines, 234.
- equipped with bumpers, 234.
 - signals, 130, 220, 243, 244.
- lights on, requirements as to, 270.
 - trip without motor required, 270, 271.
 - when required, 198, 210, 220, 243, 244.
- means of signaling between stopping places, 130, 148.
- miners riding on, prohibited, 226.
- open-hook coupling, requirements, 221, 234.
- red light on rear car of trip, 221, 244.
- signals on, 221, 243, 244.
 - to be placed on, 130, 220, 243, 244.
- swinging open-hook coupling prohibited, 221, 234.
- white light on front car of trip, 221, 243.
- signal board on rear car of trip, 221, 244.

COAL-MINE OPERATOR.

- See also Actions, Bore holes, Boys, Cages, Coal cars, Coal mines, Girls, Hoisting and hoisting equipment, Hoisting engineer, Inspection and examination of mines, Lights, Maps, Mine accidents, Mine examiner, Mine foreman, Mine inspector, Mine manager, Mining operations, Mining statutes, Negligence, Props, Reports, Rules, Shafts, Signals, Ventilation, Women, Workmen's compensation act.
- abandoned workings, duty of, on approaching, 227.
- absent owner not liable for failure to give notice of accident, 136.
- accidents, reports of, to inspector, 199, 227, 245.
- accurate map required by, 141, 146, 159, 188, 207, 212, 238.
- acting as examiner, manager, or hoisting engineer if certificated, 256, 260.
 - mine manager, 260.
- action against, for death for violation of laws, 132, 146, 158, 228.
 - of miner, 139, 140, 228.
 - willful violation of statute, 132, 146, 158, 228.
 - for death of miner, who may sue, 184, 185, 228, 229.
- act requiring scales for weighing coal valid, 386.
- additions to code of signals, 266.
- adoption and posting of rules, 201, 256.
 - of code of signals, 157, 216, 230.
- agent's negligence cause of injury, liability of, 178.
- agreement with adjoining mine owner as to use of shafts, 173.
- amount of ventilation required by, 142, 150, 152, 156, 161, 219, 234.
- application of statute as to liability for death of miner, 139, 140.
 - workmen's compensation act to, 394, 403, 418.
- attendants at doors required, 278, 279.
- bandages to be furnished by, 201, 228.
- bell signal code to be adopted, 157.
- blankets to be furnished by, 201, 227.
- blanks furnished for reports, 76, 83, 89.
- bore holes in advance of working face required, 142, 227.
 - required to be made by, 199, 227.
- bottom and top man, duty as to employment, 200, 218.
- boundary, 10-foot limit for working mine, 199, 227.
- buildings on surface, construction and location, 218, 232.
 - to be covered with fireproof material, 151, 218, 232.
- cap pieces and props to be delivered to miners, 146, 158.
 - of proper dimensions required to be kept, 146, 158.
- care required as to safe places for miners, 170.
 - to provide safe place for miner, 256.
- check weigher to be given permit by, 386.

COAL MINE OPERATOR—Continued.

- children, not to employ, 143, 148, 228.
- code of signals may be added to, 193, 204, 216, 230.
 - required, 157, 198, 204, 216, 230, 242.
 - to be posted at top and bottom of shaft, 153, 216, 231, 242.
- communications from top to bottom man, required, 198, 208.
- competency of engineer, 174, 175.
- compliance with statute as to fencing shafts, 266.
 - furnishing light at top of shaft, 157, 157.
 - liability for failure, 304.
- compulsory employment of mine examiner, no relief from liability, 308.
- connection with adjoining mine to avoid construction of shafts, 173, 241.
- conscious failure to comply with statute, as willful violation, 177-180.
- copper-tipped tamping bars required, 151, 201, 221, 234.
- corporation, firm, or person in control of mine, 202.
- court may prohibit further working on violation of law, 131, 132, 146, 188.
- crime to obstruct investigations for labor statistics, 193.
- damages limited for wrongful death, 158, 228.
 - to \$10,000, 228.
- dangerous conditions, liability for failure to mark, 290, 291, 292.
 - mine examiner's failure to mark, liability, 293.
 - of mine, liability for death of shot firer, 255.
- definition of, 202, 229.
- delegation of duties to examiner or manager, 200.
- draining water from well, liability, 186.
- duty and liability as to props, 271, 272, 273, 274, 275, 276, 277.
 - shooting down coal, 262.
- as to bore holes, 142, 227.
 - cap pieces and props, 175, 176.
 - code of signals, 187, 216, 230, 242.
 - daily inspection, 171.
 - employment of engineer, 174.
 - fencing top of shaft, 170, 241.
 - gates at top of shaft, 138, 142, 147, 153, 155, 160, 215, 230, 241.
 - keeping miners out until conditions made safe, 171.
 - lighting shaft, 178, 174, 215, 230, 241.
 - maps, 141, 146, 159, 187, 207, 212, 233.
 - refuge places, 268, 269, 276.
 - shafts, 173, 240.
 - ventilation, 142, 150, 152, 156, 161, 219, 236, 277, 281.
- duties generally, 256.
 - imposed by mining statutes, 170.
 - on notice from inspector to use safety lamps, 206, 219.
- duty to construct additional shafts, 137, 141, 147, 153, 240.
 - examine mine, miners' assumption of performance, 181.
 - fence shafts limited to coal mines, 173.
 - file reports, 76, 83, 89.
 - furnish facilities for inspection of mine, 192
 - lights at top of shafts, 187, 187, 215, 230, 241.
 - scales for weighing coal, 266, 262, 268.
 - give notice of accident or death, 130, 135, 136, 144, 148, 237.
 - have boilers inspected, 143, 191, 217, 231, 243.
 - instruct or warn workmen, 282.
 - keep haulageways clear of refuse, 268.
 - keep supply of timber, 143, 158.
 - protect entrance to shaft, 137, 142, 147, 152, 155, 160.
 - provide facilities for procuring statistics, 193.
 - fire protection, 151.
 - for safety of miners, 167.
 - submit mines to inspection, 131, 145.
- employment of boys under age, liability for injuries to, 316, 319.
 - willful violation of statute, 307.
- certified hoisting engineer required, 263.
- engineer, 174.
- incompetent engineer a willful violation of statute, 204.
- mine manager, effect on liability, 261.
- persons under 14 prohibited, 148.
 - 16 years of age prohibited, 228.
- timber man, no guarantee of safety to miners, 188.

COAL MINE OPERATOR—Continued.

- empty cages to be furnished miners at end of shift, 200.
- engineer's incompetency, liability for acts of, 175.
- engine houses to be fire proof, 218, 232.
- examination of mine and record required, 181.
- examiner and manager as vice principals, 200.
- exercise of liberty in selection of mine manager not restrained, 203.
- facilities for inspecting required, 131, 145.
 - making examination and inspection furnished by, 192.
 - to be provided for labor statistics, 193.
- failure for two years to comply with statute, 138.
 - to comply with statute as proximate cause, 138.
 - liability, 132, 142, 147, 152, 156, 228, 298.
 - mining operations enjoined, 228.
- construct shafts, 173, 228.
 - settlement of rights, 173.
- do specific things required, 262.
- equip cages with safety catches, willful violation of statute, 204.
- fence shaft, willful violation of statute, 177.
- furnish drum with brake, willful violation of statute, 177, 214.
 - lights at top of shaft, liability, 137, 157.
 - violation of statute, 305.
 - map, cost and liability, 141, 146, 150, 188, 208.
 - props on demand, liability, 175, 176.
 - scales, defense to action, 387.
 - sufficient ventilation, 156, 161, 228.
- give notice of mine accident, penalty, 130, 135, 144, 148.
- have dangerous place marked, liability, 256.
 - mine examined, willful violation of statute, 177, 179.
- instruct or warn miners, liability, 282.
- post rules, excuse from liability, 304.
 - governing shot firers, violation of statute, 304.
- properly equip cage, willful violation of statute, 177, 178.
- provide stairway in shaft, willful violation of statute, 179.
- supply props, willful violation of statute, 175, 176.
- fees for inspection, payment condition for operation, 164, 166.
 - to be paid by, 163.
- fencing top of shafts required, 170, 241.
- fine for failure to make map, 188, 208, 213, 214.
- fireproof boiler and engine houses required, 213, 232.
- fire protection required, 151, 218, 232.
- furnace for ventilation, location, 142, 150, 158, 157.
- gates open by accident, liability, 120.
- girls not to be employed by, to work in mine, 228.
- good faith not involved in willful violation of statute, 208.
 - of, 256.
- injunction to prevent operation of mine without compliance with requirements, 164, 166, 222.
 - on violation of laws, 131, 132, 146, 156, 228.
- inspection fees, payment of, condition for operation, 164, 166.
- investigations required on notice of accident or death, 130, 125, 144, 148, 245.
- insufficient time for constructing shaft, duty, 137, 139, 142, 147, 152, 155, 160, 240.
- interference with inspector's duties, liability, 201, 209.
- iron tamping bars prohibited, 151.
- knowledge of incompetency of engineer, question of fact, 175.
- liability for acts of incompetent engineer, 175.
 - death of employee falling in shaft, 253.
 - miner, pleading, 139.
 - draining water from well, 186.
 - driver's injury caused by dangerous roof, 263.
 - expenses of inspection by county surveyor, 131.
 - failure of examiner or manager to obey statute, 200.
 - to cover cage, 261.
 - employ door attendants, 278, 279.
 - fence top of shaft, 174.
 - furnish props, 175, 176.
 - instruct or warn miner, 282.

COAL-MINE OPERATOR—Continued.

- liability for failure to mark dangerous conditions, 284.
 - prop roof of entry, 256, 257.
 - protect stairway in shaft, 179.
 - provide haulageways with signals, 174.
 - refuge holes, 174.
 - support roof of entry, 268.
- injuries from incompetency of engineer, 264.
- mine manager's failure to warn or instruct, 262.
- mining under surface, 186.
- mistakes of examiner, 253.
 - inspector, 137, 158.
- negligence of holsting engineer, 265.
 - mine examiner, 249.
- substituting inefficient lighting method, 173, 174.
- willful failure to comply with laws, 132, 146, 158, 228.
 - fence shaft, 173.
- violation of laws, 132, 146, 158, 228.
- wrongful death of miner, 184, 185, 228.
- in absence of proximate cause, 262.
- where mine examiner and manager act in good faith, 263.
 - violation of statute is not proximate cause of injury, 268.
- lighting shafts, duty and liability, 266.
- lights at shafts, liability for failure to furnish, 137, 157.
 - on coal cars, application and meaning of requirement, 271.
 - required at bottom of shaft, 200, 215, 230, 241.
 - on landings when holsting men at night, 200, 215, 230, 241.
 - trips of cars, 198, 210, 221.
 - to be kept at top and bottom of shaft, 173, 174, 215, 230, 241.
- linseed oil to be furnished by, 201, 228.
- location of furnace for ventilation of mine, 142, 150, 153, 157.
- map, amendments and extensions to be shown, 141, 146, 150, 188, 208, 213, 240.
 - filing and preserving, 141, 146, 150, 187, 207, 213, 239.
 - of coal mine required by, 141, 146, 150, 157, 207, 239.
 - showing boundary lines, required, 141, 146, 150, 187, 207, 212, 239.
 - time for making amendments and extensions, 141, 146, 150, 183, 209, 213, 240.
- miners charged with knowledge of rules after posting, 201.
 - demand for props unheeded, knowledge of timber boss, liability, 175.
 - may assume performance of duty, 263.
 - not required to look for record of examination, 181.
 - working place to be kept reasonably fit, 170.
- mine examiner, employment required by statute, 257.
 - for safety of miners, 257.
- manager to withdraw miners when fans stop, 194, 224, 237.
- mining operations enjoined unless requirements complied with, 164, 166.
 - 10-foot limit, 199.
- mistake of inspector not a willful neglect of operator, 137.
- negligence and liability for, 316, 317.
- negligence, liability, care exercise by miner, 180.
 - not affected by workmen's compensation act, 403.
 - of, 317, 318.
- notice of accidents and deaths required, 130, 135, 136, 144, 148, 227, 245.
 - by person in charge, 136, 144, 148, 227.
 - to coroner, 199, 227, 245.
 - mine inspector, 199, 227, 245.
- to miners of ordinary dangers not required, 183.
- not to employ children, 143, 148, 228.
 - persons under 12 years of age, 143.
 - women or girls, 143, 148, 228.
- obstructing investigations for labor statistics, 193.
- olive oil to be furnished by, 201, 228.
- operations enjoined unless requirements complied with, 164, 166.
 - of mine without compliance with conditions, 164, 166.
- "operator" applies to party in control of mine, 202, 229.
- operator's violation of statute, liability, 201, 202, 209, 228.
- "owner or agent" not liable for failing to give notice, 136.
- payment of inspection fee, 163.

COAL-MINE OPERATOR—Continued.

- penalty and procedure on failure to construct shafts, 228.
 - ventilate mine, 228.
- for failure to give notice of mine accident, 130, 135, 144, 148.
 - make maps, 188, 206, 213, 214.
 - provide fire protection, 151.
 - obstructing investigations for labor statistics, 193.
 - operating mine without compliance with requirements, 164, 166, 228.
 - permitting use of iron tamping bar, 151.
 - violating act for weighing coal, 386.
 - statute requiring code of signals, 158.
- permit to check weigher to be given by, 386.
- permitting miners to enter mine with dangerous conditions, 320.
- personal liability for failure to maintain escapement shaft, 263.
- "person in charge" must give notice of accidents, 136.
- platform scales to be furnished in lieu of track scales, 386.
- post code of signals at top and bottom of shaft, 158, 216, 231, 242.
- procedure on failure to furnish facilities for inspection, 192.
 - refusal to permit inspection of mine, 131, 145, 192.
- where mine is operated without compliance with requirements, 164, 166, 228.
- prohibited from employing boys under 16 years of age, 228.
 - employing girls and women, 228.
 - persons under 12 years of age, 143.
- proof of failure to protect entrance to shaft, 137.
- propping roof not required of, 170.
- props, failure to supply, willful violation of statute, 175, 176.
 - of proper length required to be kept, 146, 158.
 - suitable dimensions must be delivered to miner, 175, 176.
 - length must be furnished on demand of miner, 175.
 - to be delivered of dimensions specified by miner, 271.
 - to miners, 146, 158.
 - supplied to miner by, 271.
- provisions for safety of miners required, 167.
- question of fact, 174, 175.
- rate of speed of cages, 200, 218.
- record of deaths and injuries, 227.
 - examination of mine, sufficiency of report and record of examination, 181, 225, 238.
 - injuries required, 199, 227.
- recovery of penalty for use of iron tamping bar, 151.
- refuge holes required to be made in gangways and roadways, 198, 210, 243.
- refusal to pay inspection fee, effect, 164, 166.
 - permit inspection, penalty and procedure, 131, 145.
- removal of gates inclosing top of shaft, violation of statute, 266.
- reports when coal mine is worked out, 141, 147.
- requirement as to employment of mine manager valid, 248.
 - ventilation, 142, 150, 152, 156, 161.
- rules in conflict with statute, effect, 287.
 - proof of custom to show abandonment, 257.
 - to be posted at pit mouth of mine, 201, 226.
 - on engine house, 201.
- safety lamps, property of, 200, 219.
 - to be furnished by, 200, 219.
 - requirements imposed by mining statutes, 170.
- scales for weighing coal to be provided by, 388, 392, 393.
 - defense to action for failure to provide, 387, 388, 390.
- shot firers to be employed by, 376, 377, 378.
- signals, efficiency may be increased by, 198, 205, 216, 281.
 - required, 198, 204, 216, 231, 242.
 - in gangways and haulageways, 198, 210, 216, 231, 242.
- single recovery for injuries to miner, 184, 185.
- statute as a guaranty of competency of engineers, examiners, and managers, 258.
 - imposing personal liability valid, 249.
 - relieves of duty to inquire as to competency of employees, 258.
 - mine manager, 258.
- statutory and common law liability for negligence, 317, 318.
 - liability for negligence not imposed, 255.
 - requirements as to props, 271-277.

COAL-MINE OPERATOR—Continued.

- stretchers to be furnished by, 201, 227.
- subject to exercise of police power, 248.
- substitution of precautionary measures, *liability*, 204.
 - statutory requirement, 203.
- sufficiency of ventilation, 142, 150, 152, 156, 161, 219, 222.
- supply of timber required, 146, 158.
- timber boss' knowledge of failure to furnish props, *liability*, 175.
 - for use of miner required to be kept, 146, 158.
- time for complying with provisions of statute, 138, 139, 142, 147, 152.
 - given for construction of additional shaft, 137, 142, 147, 162, 165, 180, 202.
- unlawful to operate mine without compliance with law, 164, 166, 188, 208.
 - permit other than certificated engineer, examiner, and manager to serve, 202.
- use of uncovered cage, willful violation of statute, 123, 143.
- ventilation of mine required, 142, 150, 152, 156, 161, 219, 222.
- violation of statute, concurring cause of injury, *liability*, 313, 314.
 - liability*, 201, 202, 209, 228.
 - for death or injury of miner, 184, 185, 228.
 - injury of negligent shot firer, 204.
 - notwithstanding miner's contributory negligence, 221-226.
 - mining operations enjoined, 228.
 - negligence of shot firer no defense, 230.
 - not proximate cause, no *liability*, 262.
 - operations prohibited, 131, 132, 145, 156, 228.
 - proximate cause of injury, 138.
 - requiring code of signals, 158.
 - when willful, 138.
- weighing coal at mines, duty as to, 306, 302, 303.
- willful failure to comply with statute, effect of negligence, 180.
 - liability*, 122, 146, 158, 228.
 - liability* where miner is negligent, 122.
 - question of fact, 177-180.
- violation of statute, abstracts of decisions relating to, 305-317.
 - as to fencing shaft, 174.
 - does not involve good faith, 256.
 - failure of examiner or manager to perform duties, 202.
 - to supply props, 175, 176.
 - instances, 305-317.
 - liability*, 132, 146, 156, 228.
 - and penalty, 201, 202, 209, 228.
 - meaning, 138.
 - proof, 179, 180.
 - what constitutes, 305-317.
- women employment in mines by, prohibited, 228.
- workmen's compensation act, application of, 304, 406, 418.

COAL MINERS.

See County mining board, Examination of miners, Miners, Miners' examining board, Mining operations.

COAL MINES.

- See also Coal cars, Coal-mine operator, Doors, Explosives, Inspection and examination of mines, Maps, Mine accidents, Mine examiners, Mine fire fighting equipment, Mine foreman, Mine inspector, Mine manager, Mining operations, Mining statutes, Shafts, Survey of mines, Ventilation.
- abandoned workings, duty of coal-mine operator on approaching, 237.
- accidents in, rescue work, 29, 31, 227.
- act regulating use of permissible explosives, 17.
 - relating to drainage, 7, 8, 9.
- air currents in, measurements required, 184, 202, 204.
- annual survey of workings required, 50, 123, 141, 147, 150, 187, 207, 212.
- appliances to secure safety in, required by legislation, 203.
 - used in, construction and meaning, 2.
- automatic sprinklers required, 23, 28, 43, 45.
- black powder, regulations as to use, 16, 17.
- blasting powder, use of, regulation, 187, 210, 211.
- bore holes required in operating, 190, 227.
- boundaries, 10-foot limit, 190, 227.
- boys under 16 not to be employed in, 228.
- buildings on surface, regulations as to, 217, 222.

COAL MINES—Continued.

- care required in use of explosives in, 197, 210, 211, 218, 232.
- classification as to number of miners as basis of legislation, 163.
 - for legislative purposes, 163.
 - of miners for legislation, 3.
- "coal mine" and "mine" include all parts of mining plant, 223.
 - meaning, 202.
- code of signals required, 196, 204, 216, 230.
- communication with adjacent mine, 190, 241.
- compliance with requirements, condition for operation, 164, 166.
- connection with railroads, 4.
- constitutional provision for protecting operators, 3.
- constitution requires laws for protection of operators, 2, 2.
 - railroad to coal bank, 4.
- danger notices to be posted by mine examiner, 196, 205.
 - signals to be displayed, 194.
- dangerous places to be marked, 194, 225, 238.
- definition of, 202, 229.
- distance from main shaft to escapement shaft, 189, 214, 240.
- drainage, 5, 6, 7, 8, 9.
- "drift" any horizontal way into, 202, 229.
- dusty roadways, duty to sprinkle, 211, 220, 233.
- duties of mine examiners as to, 195, 203, 205, 225, 238.
 - mine managers as to inspection and examination, 195, 203, 205, 224, 232.
 - ventilation of, 194, 219, 224, 233, 237.
- employment of girls and women in, prohibited, 228.
- equipment for fire fighting, 33-45, 46-47.
 - required, 3.
- examination and inspection by mine examiners, 195, 196, 203, 205, 225, 238.
 - of by inspectors, 192.
- "excavations" definition of, 202, 229.
 - include all parts of mine excavated, 202, 229.
- employment of fire boss regulated, 56.
 - hoisting engineer regulated, 56.
- explosives, handling and storing in, 197, 210, 218, 232.
 - storage in, requirements, 197, 210, 218, 232.
 - used in, regulation, 197, 210, 211, 218, 232.
- failure to inspect as willful violation of statute, 178, 179.
- girls not to be employed in, 228.
- includes surface and underground plants, 202, 229.
- Injunction to prevent operations without compliance with requirements, 164, 166, 228.
- inspection of required, 192.
- inspector to make personal examination of, 192.
- judge of proper court may appoint persons to make survey, 185.
- laws protecting operators, 2.
- magazine for storing explosives, 18, 218, 232.
- main shaft, provisions as to, 188, 189, 214, 240.
- map of survey and workings required, 50, 128, 141, 159, 187, 207, 212.
- marking dangerous places required, 196, 205, 225, 238.
- mine examiner required at all, 224, 237.
 - inspectors to test scales for weighing coal, 48, 49.
 - meaning, 202, 229.
- miners may assume examination has been made, 181.
 - must be kept out until conditions are made safe, 181, 225, 238.
 - under 16 must not be employed, 228.
- mines in which shot firers are to be employed, 376, 377, 378.
- notice of danger to be posted by mine examiner, 196, 205.
- number of men employed without shafts, 189, 214.
- operations enjoined unless requirements complied with, 164, 166.
- operator not to employ mine manager without certificate, 56.
 - to furnish facilities for examination and inspection, 192.
- passageway to escapement shaft required, 189, 214, 241.
- penalty for operating without compliance with requirements, 164, 166, 228.
- procedure to have examination and survey, 185.
 - where operated without compliance with requirements, 164, 166, 228.
- purpose of survey of, 185.
- railroads to be constructed to, 4.
- record of survey of not required, 185.

COAL MINES—Continued.

- refuge holes required on engine planes and mule roads, 198, 210, 217, 231, 244.
- regulation of mines within police powers, 199.
- requirements as to main shaft, 188, 189, 214, 240.
 - shafts, 189, 190, 214-217, 230-232, 240.
 - underground stables, 34, 39, 43, 45.
- rescue work in case of accident, 29, 31, 227.
- roads to, 7.
- roadways in, obstructions to be removed from, 194.
 - to shafts, weekly inspection required, 194, 217, 232.
- safety legislation required as to, 167, 168.
- "shafts" any vertical opening into mine for escapement, hoisting or ventilation, 202, 229.
- shot firers to be employed in, 376, 377, 378.
- signals required in, 198, 204, 216, 220, 242.
- slope, inclined way to seam of coal, 202, 229.
- special survey by mine inspector, 50.
- sprinkling required, 33, 38, 43, 45, 194, 197, 211, 220, 233.
- storage of explosives in, 197, 210, 218, 232.
- telephones required in, 35, 40.
- two places of egress required, 189, 214, 240.
- unlawful to employ girls and women in, 228.
 - miners in without two egress places, 189, 215, 240.
 - operate without compliance with conditions, 164, 166, 228.
- use of explosives in, 16, 16, 17, 218, 232.
- ventilation of, 194, 198, 206, 219, 232, 233.
 - required by legislation, 168.
- women not to be employed in, 228.
- "workings" definition of, 202, 229.
 - include all parts of mine excavated, 202, 229.
 - not to be driven nearer than 10 feet to boundary, 199, 227.

CODE OF SIGNALS.

See Cages, Mining operations, Shafts, Signals.

COMBINES, POOLS, ETC.

See Mining corporations.

COMMISSION TO INVESTIGATE MINING.

See Mining investigating commission.

CONSTITUTION.

- See also Legislature, Mining statutes.
- amendment to classify mining laws, 2.
- annotations to, 2-4.
- causes requiring legislation, 247.
- classification of miners, 3.
- construction of provision requiring statutes for miners' protection, 8.
- general assembly required to pass laws for protection of miners, 2.
- legislation as to mining required, 2.
 - for health and safety of miners, 2.
 - safety of miners, 2.
 - pursuant to mandatory requirements, 167.
- mandatory provisions for protection of miners, 2.
 - requirement as to mining legislation, 167.
- mining statutes classified to themselves, 247.
 - enacted pursuant to, 247.
- requirement as to construction of railroad to coal banks, 4.
- requires legislation to protect miners, 167.
- requiring laws protecting miners, 2.
- safety legislation for miners required, 167, 169.
- section 29 of article 4 construed, 2, 3.
- statutes as to ventilation required, 3.

CONTRIBUTORY NEGLIGENCE.

- See also Actions, Assumption of risk, Miners, Mining operations, Mining statutes, Negligence.
- abstracts of decisions as to abrogation of defense, 331-335.
- act of miner as proximate cause of injury, recovery, 334.
- cases of assumed risk, 335.
- defense abrogated, 331-335.
 - abstracts of decisions as to, 331-335.
 - instances, 331-335.
 - of unavailing in actions for violation of statute, 317.
 - where employee elects not to accept compensation, 431.

CONTRIBUTORY NEGLIGENCE—Continued.

- effect under workmen's compensation act, 434.
- exercise of due care for safety, meaning, 334.
- incompetent engineer, recovery by injured miner, 335.
- instances where defense of is abrogated, 331-335.
- instructions of court as to, 322.
- mine examiner searching for gas with open lamp, 336.
- miner acting under sudden danger, recovery, 334, 335.
 - entering mine with dangerous conditions, recovery, 334.
 - riding in uncovered cage, 334.
 - cooperation in performance of negligent act, recovery, 317.
 - knowledge of danger, effect, 139.
 - dangerous conditions, recovery, 335.
 - violation of duty, effect on recovery, 336.
 - working after demand for props, recovery, 335.
 - under dangerous roof, recovery, 333, 334.
- negligence of shot firer no defense where operator violated statute, 330.
- no application to violation of statute, 182.
 - defense in miner's action for violation of statute, 277.
 - defense to miner's action, 298.
 - not a defense to miner's action, 139.
- operator's violation of statute, miner's negligence no defense, 277.
- shot firers' no defense, 332.
- unavailing as a defense in actions for violation of statute, 317.
 - in actions for violation of statute, 331, 332, 333, 334, 335.
- violation of statute, averment as to exercise of care unnecessary, 335.
 - by operator, shot firer's unlawful act no defense, 330.
 - miner violating rules, recovery, 334.
 - want of care on part of miner immaterial, 335.
- willful disregard of statute, recovery not defeated by, 182.

CORONER.

- See also Coal-mine operator, Mine accidents, Notice.
- expenses of inquest over dead miners, 1.
- inquest in case of death in mine, 199, 227.
- notice to, on death of miner, 130, 135, 136, 148, 227.
- payment of expenses of inquest, on deceased miner, 1, 130, 135, 148.

COUNTY INSPECTORS.

- See County mining board, Mine inspectors.
- appeal in proceedings for appointment, 87.
- appointed to assist State inspector, 75, 81, 87.
- appointment by county boards, 135.
 - judge of county court, 87.
 - of, 194.
 - assistant, 164.
- assistant appointed on request, 164.
 - to State inspector, 75, 81, 87, 194.
- authority given by State mine inspector, 75, 81, 88.
 - must be shown on demand, 75, 81, 88.
 - in writing, 75, 81, 88, 194.
 - of conferred in writing, 194.
- bond of State inspector covers acts of, 75, 82, 88.
 - to county board required, 135.
- compensation fixed by county board, 75, 81, 87.
 - of county inspector, 75, 81, 87, 135, 164, 194.
 - paid by county treasury, 75, 81, 87.
- competency of, 164.
- county board to show cause for failing to appoint, 87.
- eligibility for appointment, 75, 81, 87, 194.
- failure of county board to appoint, 87.
 - make appropriation for, 87.
- inspection by, 135.
- judge may require county board to make appropriation, 87.
- oath of office, 135.
- payment of compensation by county, 75, 81, 87, 135, 164, 194.
 - of, 75, 81, 87, 135, 164, 194.
- procedure when county board refuses to appoint, 87.
- production of written authority on demand, 194.

COUNTY INSPECTORS—Continued.

- proof to county board of experience, 135.
- removal by judge, 87.
- request for appointment of, 164.
- State inspector liable for acts of, 75, 81, 88.
 - may make written request for appointment, 75, 81, 87.
 - to show causes for appointment, 87.
- term of office of county inspector, 135.
- under authority of State mine inspector, 75, 81, 88.
- work done under authority of State inspector, 75, 81, 87.
- written authority from State inspector, 75, 81, 88.
 - request for appointment, 75, 81, 87, 194.

COUNTY MINING BOARD.

- See also Certificates, Miners, Miners' examining board, State mining board.
- act to provide for employment of coal miners by, 92, 94.
- certificates by to coal miner, 92, 94.
 - from, condition for employment of coal miners, 93, 95.
- coal miners not employed without certificate, 93, 95.
- compensation of members, 93, 95.
- counties required to have miners' examining boards, 92, 94.
- county miners examining boards in each county, 92, 94.
- duties, 93, 94, 95, 96.
- election of officers, 92, 95.
- examinations of applicants, 92.
 - coal miners, 92, 94, 95, 99.
 - miners as to competency, 93, 95.
- meetings, 93, 95.
- organization and election of officers, 92, 95.
- power to administer oaths, 94, 95.

COUNTY SURVEYOR.

- See also Inspection and examination of mines, Maps, Mine inspector, Survey of mines.
- compensation for inspection of mines, 130.
- duties as to inspection of mines, 130, 131.
- ex officio inspectors of mines, 130, 135.
- inspection of mines by, 135.
- payment of compensation for examination of mines, 131.
- statistics to be collected by, 131.
- tabulation of facts required, 131.

CRIMES.

- acts relating to explosives, 11-17.
 - oil inspection, 346, 348, 349, 353, 355.
 - permissible explosives, 18.
- blasting powder used in coal mines, 15-18.
- changing check or device on loaded car, 227.
- code of signals required, 158.
- contracts for payment of miners other than in money, 106.
- conviction of mine manager invalidates certificate, 36, 41.
 - revokes certificate, 36, 41.
- mine operator for failure to make map of mine, 50, 128, 141, 147, 159, 183, 208.
- owner or operator for false weights, 48.
- State mine inspector, 37, 41.
- for violating mine fire-fighting equipment act, 36, 41.
- daily offense for failure to provide miners' washrooms, 112.
- duty of mine inspectors as to weighing coal, 48, 49.
 - operator or owner as to testing scales, 48, 49.
 - weighing coal, 48, 49.
- dynamite, gunpowder, nitrochlorate, nitroglycerin, powder magazines, acts relating to, 11-18.
- employment of uncertificated miners, 94, 96, 98.
- entering upon coal banks without consent of owner, 58, 59.
- explosives, acts relating to, 11-18.
 - in coal mines, 15-18.
- failure of coal-mine operator to give notice of mine accident, 130, 228.
 - mine inspectors to make reports, 77, 83, 89.
 - operator to make map of coal mines, 50, 128, 141, 147, 159, 183, 208.
 - owner or operator to adjust scales for weighing coal, 48.
- to stamp black blasting powder, 17.
- fines, minimum and maximum amount, 130.

CRIMES—Continued.

- for employment of uncertificated miners, 94, 96, 98.
- imprisonment, minimum and maximum amount, 130.
- iron tamping bars without copper tips unlawful, 151.
- mine inspector's failure to have coal mines surveyed, 50.
- miner injuring mining machinery or property, 132.
- minimum and maximum amount of fine or imprisonment, 120.
- obstruction of investigations for labor statistics, 193.
- oil, sale of inferior grade, 221, 234.
 - well driller, failure to plug well, 357, 358.
- penalty for entering upon coal banks of another without consent, 50, 52.
 - failure to adopt and post code of signals, 158.
 - give notice of mine accident, 130.
 - mine inspector's failure to report, 77, 83, 89.
 - survey coal mine, 50.
 - violation, minimum and maximum amounts, 130, 144.
 - of act requiring miners' washroom, 112.
 - statute, 201, 202, 209, 228.
- plugging oil wells, violation of act requiring, 357, 358.
- punishment for violating mine fire fighting equipment act, 36, 41.
- sale of oil below requirements, 221, 234.
- shot firer's violation of statute, 376, 377.
- transportation of explosives, 12, 13.
- trespass on coal bank, 58.
- unlawful to change or remove any check or device indicating identity of miner, 236.
 - to use iron tamping bars, 151.
- use of inferior grade of oil, 221, 234.
 - iron tamping bars, unlawful, 151
- using inferior grade of oil, 221, 234.
- violation of act as to boilers, 148.
 - bore holes, 148.
 - cages, 148.
 - coal cars, 148.
 - employment of girls, 148.
 - escapement shafts, 148, 228.
 - employment of minors, 148.
 - women, 148.
 - gangways, 148.
 - signals, 148.
 - uncovered cages, 148.
 - ventilation, 148.
 - weighing coal, 48.
 - at mines, 386, 388, 390.
- for payment for coal mined, 109.
- requiring fencing and guarding shafts, 148.
 - miners' washroom, 112.
 - payment of miners in money, 106.
 - semimonthly payment of miners, 110.
- black blasting powder act, 17.
- mine fire fighting equipment act, 36, 41.
- mining statutes, 201, 202, 209, 228.
- statute requiring code of signals, 158.
- workmen's compensation act, 402.
- weighing coal at mines, operator's violation, 386, 388, 390.

CROSSCUTS,

See Ventilation.

D

DAMAGES.

- See also Actions, Miners, Workmen's compensation act, Wrongful death.
- action for, wrongful death, 132, 146, 158.
 - single recovery, 342.
- as actual and probable consequence of wrongful act, 342.
- coal-mine operator liable for willful violation of act, 132, 146, 158.
- compensation for injuries recoverable, 184.
- direct for injuries, meaning, 341.
- distribution among beneficiaries, 185.
- eminent domain, assessment, 5.
- entire recovery in single action, 341.

DAMAGES—Continued.

- mother of nonresident alien may sue for, 185.
- next of kin may recover, 132, 146, 158.
- one action only maintainable, 184.
- pecuniary loss to all beneficiaries included in recovery, 342.
- recovery for mental suffering, pleading, 342.
 - in single action, 184, 341, 342.
 - of all in single action, 184.
 - for wrongful death, 184.
 - where willful conduct caused the injury, 342.
- single recovery only, 341.
- willful violation of statute, compensation only recoverable, 184.
- sufficiency of pleading to recover for mental suffering, 342.
- widow may recover, 132, 146, 158.

DANGEROUS CONDITIONS.

See Mining operations.

DANGER SIGNAL.

See Coal mines, Mine fire fighting equipment, Signals.

DEATH.

See Wrongful death.

DEPARTMENT OF MINES AND MINERALS.

See also Director, mine firefighting equipment, Mining board.
administrative and executive officers, salaries, 438.

officers, 437.

advisory boards, duties, 437.

appropriations, 440.

cooperation with University of Illinois, 439.

creation, 437.

department, meaning, 437.

director, 437.

director's duties, 437.

as executive officer of mining board, 439.

qualifications, 437.

duties and powers, 439.

as to fire-fighting equipment, 442, 443.

mine accidents, 438.

of advisory and nonexecutive boards, 437, 438.

inquiries into mineral industry, 439.

meetings of mining board, 439.

mine officers, 437.

miners' examining board, 437.

officers, qualifications, 437.

mining board, creation, 437.

duties and powers, 438, 439, 440.

to examine applicants for inspectors, 439.

nonexecutive boards, duties, 437, 438.

offices abolished, 438.

officers of, 437.

powers of, 438.

as to ventilation, 444.

advisory and nonexecutive boards, 437, 438.

State mining board abolished, 438.

DIRECTOR.

See also Department of Mines and Minerals.

Department of Mines and Minerals, appointment, 437.

duties, 437, 438.

qualifications, 438.

salary, 438.

duties as executive officer of mining board, 439.

executive officer of mining board, 439.

DITCHES.

See also Drains and roads, Drainage of mines, Eminent domain, Right of way.

appropriation of land for drainage of mines, 5.

construction for draining mines, 7, 8.

drainage of mines by, 5, 6, 7, 8, 9.

use by landowners, 6.

right of way for draining mine, 9.

DOORS.

- See also Coal-mine operator, Mining operations, Ventilation.
- attendants to be employed at, 278, 279, 280, 445.
 - not required at automatic, 445.
- automatic, failure of operator to furnish, liability, 279, 280.
 - required, 278, 279, 445.
- duty of attendants, good faith expected, 278.
- failure of operator to employ attendants, violation of statute, 278.
- good faith of operator in employment of mine manager, 279.
- liability of operator for failure to employ attendants, 279.
 - injuries for failure to employ attendants, 278.
- opening and failing to close, a misdemeanor, 132, 146, 201.
- permanent or temporary, distinction, 279, 280.
 - principal, or temporary, meaning, 279, 280.
- principal or temporary, question of fact, 279, 280.
- purpose of attendants at, 278.
 - statute in requiring, 279, 280.
 - attendants, 280, 281.
- required for ventilation, 278, 279, 280.
- safety of drivers contemplated by use of, 279, 280.
- willful violation of statute, failure of operator to employ attendants, 278.

DRAINAGE OF MINES.

- See also Ditches, Drains and roads, Eminent domain, Right of way.
- act providing for, 8.
 - relating to, 5.
 - revising law in relation to, 6.
- amendatory act providing for, 9.
- commissioners to award damages, 6.
 - lay out and construct work, 8.
- damages for lands taken, 6.
- ditches and pipes used for, 5, 6, 7, 8, 9.
- drainage districts organized, 8.
- proceedings for acquiring land for, 7, 8, 9.
 - appropriation of land, 5, 6, 8.
- use of pipe by landowners, 6.

DRAINS AND ROADS.

- act revising law in relation to, 6.

DYNAMITE.

- See also Explosives, Powder, Powder magazine.
- act regulating use of, 11-17.
- manufacture, sale, storage, and transportation regulated, 12, 13, 14.

E

ELECTRICAL APPLIANCES.

- excessive voltage as a dangerous condition, 286, 287.
- feed wires over haulageways protected, 221.
- live wire as a dangerous condition, 286, 287.
- requirements as to, 221.
- terminal ends of positive wires to be guarded, 221.
- trolley wires not to exceed 275 volts, 221.
- voltage of trolley wires, 221.
- wires crossing haulageways, guarded, 221.

ELECTRIC LAMPS.

- See also Safety lamps.
- use for testing explosive gas prohibited, 219.
 - of permitted, 219.

EMINENT DOMAIN.

- See also Ditches, Drainage of mines, Drains and roads, Right of way, Road and roadways.
- act relative to mining for lead ore, 5.
- amendatory act for drainage of mines, 9.
- annotations, 119.
- appropriation of land, assessment of damages, 5.
- award of commissioners, 6.
- benefits set off against damages, 8.
- commissioners to assess damages, 5.
 - duties and powers, 5.
 - for drainage of mines, 7, 8, 9.

EMINENT DOMAIN—Continued.

- damages for lands for draining mines, 7, 8, 9.
- deposit of mine refuse, 5.
- ditches for drainage of mines, 5, 6, 7, 8, 9
- drainage districts for draining mines, 8.
 - of mines, 5, 6, 7, 8, 9.
 - appropriation of land, 5.
- drains and roads for mine, 6, 7.
- lead mine, drainage, 5.
- mine refuse, place for deposit, 5.
- mining corporation, draining of mines, 5.
- notice to landowner, 5, 6.
- proceedings for appropriation of land, 5.
 - draining mine, 5, 7, 8, 9.
- right of way for ditch for draining mine, 9.

EMPLOYERS' LIABILITY ACT.

- See Workmen's compensation act

ENGINE HOUSE.

- See Hoisting engine.

ENGINE PLANES.

- See also Gangways.
- refuge holes required on, 198, 210.

ENGINEERING DEPARTMENT AT UNIVERSITY.

- See also University of Illinois.
- act authorizing, 10.

ESCAPEMENT SHAFTS.

- See Shafts.

EXAMINATION OF MINERS.

- See also Certificates, Coal-mine operator, Miners, Miners' examining board.
- acts requiring, 92, 94, 96, 99.
 - constitutional, 102.
- applicants must prove qualifications, 92, 93, 95, 98.
- appointment of miners examining board, 92, 94, 97, 100.
- board must give notice of time and place of meetings for, 97, 100.
- certificate as evidence of qualification to work as miner, 102.
 - for employment in coal mines, 92, 94, 95, 99.
 - issued permitting employment, 92, 93, 94, 95, 96, 99.
 - to miner not sufficient as shot firer, 102.
- coal miners not employed without certificates, 92, 94, 96, 99.
- damages for violation of act, 103.
- employment of miners without examination prohibited, 93, 96, 99.
- examining board for county, 92, 94.
 - State, 97, 100.
- holders of certificates entitled to employment, 92, 93, 94, 95, 96, 99.
- meetings of board for examinations, 93, 95, 97, 100.
- method of conducting, 93, 95, 98.
- miners without certificates prohibited employment, 93, 96, 99.
- notice of time and place of meetings for, 97, 100.
- penalty for violation of act, 103.
- places of meetings for examinations, 93, 95, 97, 100.
- times for meetings for examinations, 93, 95, 97, 100.
- violation of statute, penalty, 103.

EXPLOSIVES.

- See also Dynamite, Miners, Mining operations, Nitrochlorate, Nitroglycerin, Powder, Powder magazine, Shot firer.
- acts regulating, 11-17, 218, 221, 232, 234.
 - character of permissible explosives, 17.
 - manufacture, sale and use, 11-17.
 - use of powder in coal mine, 15, 16, 17, 221, 234.
- amendatory act, 16.
- attention and instruction of mine manager as to handling and storing, 194, 222, 235.
- authority to manufacture, sell, or transport, 13, 14, 15.
- black powder, act regulating character and use in coal mine, 16.
 - blasting coal, regulation, 16, 17.
- blasting caps, storage, 18.
 - coal with, requirements, 222, 235.
 - shots under direction of mine manager, 194.
- blasts in shafts sinking exploded by electricity, 214.
- boxes, different kinds of powder not to be kept in, 197, 210, 222, 235.

EXPLOSIVES—Continued.

- boxes for storing in mines, 197, 210, 222, 235.
 - distance between, 197, 210, 222, 235.
 - method of opening, 197, 210, 222, 235.
- business of manufacturing regulated, 11-17.
- coal dust not to be used in tamping, 197, 211, 223, 236.
 - mine operator to comply with requirements as to use, 202.
- consent of persons for manufacturing, 13, 14.
- copper-tipped tamping bars required, 151, 222, 235.
 - tools for tamping, 197, 211, 222, 235.
- dead hole, drilling or shooting prohibited, 223, 235.
 - meaning, 222, 235.
- detonators, storage, 18.
- dusty mines, sprinkling before blasting, 197, 211.
 - road to be sprinkled, 194, 197, 211.
- duty of miner as to handling and using, 197, 210, 222, 235.
- examination required between shots, 197, 211, 223, 236.
- heel of shot, meaning, 222, 235.
- iron or steel pointed tools not to be used, 197, 211, 222, 235.
- lights, use in connection with handling, 197, 210, 211, 222, 235.
- location of building for storage, 191, 218, 232.
- lubricating oil, use in mines, 232.
- manner of handling, 197, 210, 222, 235.
- manufacture and storage, regulation, 12, 14, 15.
 - of, regulated, 13, 14, 15.
- manufacturing in towns prohibited, 13.
- marking packages, 12, 221, 234.
- miner using squibs, duty, 197, 211, 223, 236.
- missed shot, methods of withdrawing, 223, 236.
 - miner's duty as to, 197, 211, 223, 236.
 - time before returning to, 197, 211, 223, 236.
 - withdrawn by copper tipped or wooden tool, 223, 236.
- mixed shots prohibited, 222, 235.
- not more than one shot at a time to be ignited, 197, 211, 223, 236.
- nuisance, 11-17.
- oil not to be heated over fire, 232.
- permissible, brand and grade established by United States Bureau of Mines, 27, 28.
 - grade, and mark, 17, 18.
 - construction of magazine for storage, 18.
 - explosives, 17.
 - grade and brand, 17, 18.
 - ingredients, variations permitted, 18.
 - magazine for storage, 18.
 - marking, 18.
 - packages, 17, 18.
 - mine inspectors, duties relating to, 18.
 - sample testing, 18.
 - storage, 18.
 - testing by United States Bureau of Mines, 28.
 - violation of act, crime, 18.
- permit for manufacturing required, 13, 14.
- place and manner of storing, 197, 210, 218, 222, 232, 234.
- powder in coal mines, 15, 16, 17.
 - used for blasting, 197, 210, 221, 234.
- quantity of powder in blasting coal, 15, 16.
 - one charge, 222, 235.
 - shot, 222, 235.
 - permitted to each miner, 197, 210, 222, 234.
- records relating to manufacture and sale, 13, 14.
- regulation and use of permissible, 17, 18.
 - of business relating to, 11-17.
- scraper not to be used for tamping, 222, 235.
- shots, method of firing, 197, 211, 223, 236.
 - miner's duty, 197, 211, 223, 236.
 - on firing, 197, 211, 223, 236.
 - number to be fired at one time, condition, 197, 211, 223, 236.
- solid shooting, requirements as to, 222, 235.

EXPLOSIVES—Continued

- stamping black powder packages, 17.
- standard charges, 222, 235.
 - form and size, 222, 235.
- storage in fireproof building, 191, 218, 232.
- storing in mine, 197, 210, 218, 221, 232, 234.
 - regulated, 12, 14, 15.
- tamping, scrapper not to be used for, 222, 235.
 - with iron bars prohibited, 151, 222, 235.
 - soft material required, 197, 211, 222, 235.
- transportation, marking packages, 12.
 - regulations relating to, 12, 14, 15.
- unlawful to use iron tamping bars, 151.
- use of squibs, method prescribed, 197, 211, 222, 235.
- warning before firing, 223, 236.

F**FELLOW SERVANT.**

See Miners.

FENCES.

See Mining operations, Coal-mine operator, Shafts.

FIRE BOSS.

- See also Certificates, Mine managers, Miners, Miner's examining board, Mining operations, State mining board.
- certificate exchanged for mine examiners, 55.
 - of competency before employment, 55.
 - qualification required, 54, 55.
- competency and qualification, 54-55.
- employment without certificate, liability, 55.
 - prohibited, 55.
- examination by board of examiners, 55.
 - for certificate, 54, 55.
- experience in coal mines, 54-55.
- mine manager same as, 202.
- mining board may exchange certificate, 54.

FIRE DRILL.

See Mine fire-fighting equipment.

FIRE FIGHTING EQUIPMENT.

See Mine fire fighting equipment, Mine fire fighting and rescue stations.

FIRST AID.

- See also Mine accidents, Mine examiners, Mine rescue work.
- certificate from commission as to, 79.
- examination of mine examiner as to knowledge of, 79.

FOREMAN.

See also Mine foreman, Mine manager.

G**GANGWAYS.**

- See also Coal cars, Entries, Haulageways, Mining operations, Refuge holes.
- application of statute as to appliances on, 139.
- coal cars on, equipped with signals, 130, 143, 148
- motive power and application of statute, 130.
- refuge holes required on, 196, 210.
- refuge places in sides of, required, 130, 143.

GATES.

- See also Mining operations, Shafts.
- at landings in shafts, meaning, 266.
 - required, 215, 230, 241.
- automatic at top and lower landing, 215, 230, 241.
- sufficiency as compliance with statute, 266.

GAUGES.

See Boilers.

GENERAL ASSEMBLY.

See Legislature.

GEOLOGICAL COMMISSION.

- See also Engineering department at university, Geological survey, Geologist, University of Illinois.
- appointment of commissioners, 19, 24.
- director, 24.

GEOLOGICAL COMMISSION—Continued.

appropriation, 25, 26, 27.
duties and powers, 24.
personnel, 24.

GEOLOGICAL SURVEY.

See also Geological commission, Geologist, Reports, University of Illinois.
act to establish at University of Illinois, 24.
amendatory act as to bureau of State geological survey, 26.
appropriations for commission, 25, 26, 27.
 geological and mineralogical survey, 20, 27.
 Paine's report, 22.
bureau of State geological survey, 24.
commissioners appointed for making, 19.
distribution of reports, 24.
duties and objects of bureau of State survey, 24.
geological maps prepared, 24.
publication of reports, 20-27.
reports of bureau, 24.
resolution relating to, 19.
study of geological formations, 24.
 mineral resources, 24.

GEOLOGISTS.

See also Geological commission, Geological survey, Reports, University of Illinois.
acts relating to, 19-27.
 requiring inspectors to furnish information to, repealed, 164.
amendatory act for geological survey, 20.
annual report required, 19.
appropriation for, 20.
chemical analysis of minerals required, 19.
curator of library and museum to perform duties of, 23.
duties, 19, 20, 23.
employment by State officers, 19.
examination for deposits of mineral, 19.
geological survey of State, 19.
information to be given by mine inspectors, 48.
inspectors to furnish information on request of, 149.
mineral cabinet arranged, 20.
mineralogical survey of State, 19.
minerals specimens collected, 20.
 furnished institutions of learning, 21.
repeal of act requiring information from inspectors, 164.
reports and distribution, 19.
 appropriations for distribution, 21-23.
 of survey, 20.
request for information from inspectors, 149.
salary, 20, 21, 22.
search for minerals, 19.
statistics furnished on request of, 149.

GIRLS.

See also Boys, Miners, Mining operations, Minors, Women.
employment in mines prohibited, 129, 132, 133, 134, 143, 148, 198, 205, 228.

GUNPOWDER.

See also Explosives, Mining operations, Oils, Powder, Shot firers.
acts relating to, 11-17.

H

HAULAGEWAYS.

See also Coal cars, Doors, Electrical appliances, Gangways, Gates, Mining operations, Inspection and examination of mines, Lights, Refuge places, Roads and roadways, Signals.
application of statute to, 174.
clean space on one side of, 221.
distance from track to rib, 221.
dusty to be sprinkled, 194.
duty and liability of operator as to, 268.
failure of operator to keep clear of refuse, 268.
 support roof over, liability to trip driver, 268.
 to provide with signals, liability, 174.
free from gob on one side, 221.

HAULAGEWAYS—Continued.

- gob deposits in, prohibited, 221.
- keeping free from obstruction, 209.
- liability for injuries caused by low roof, 318.
- mine manager required to sprinkle, 224, 237.
- one side to be clear of refuse, 221.
- refuge places required on, 198, 210, 243.
 - duty of operator, 268, 269.

- rope haulage roads, signals on, 221.
- signals on between engineer and points on, 221.
- space between cars and ribs, refuge places, 269.

HOISTING AND HOISTING EQUIPMENT.

See also *Bollers, Cages, Hoisting engineer, Inspection and examination of mines, Lights, Mine inspector, Mining machinery, Mining operations, Shafts, Signals.*

- application and construction of statute as to, 264.
- brake attached, 190.

- to drum, 216, 230, 242.
 - in shaft sinking, 214.

- on drum operated by engineer, 190, 242.
 - purpose of requirement, 265.
 - required, 214, 242.

- to prevent accidents, 265.

- bucket or cage attached to rope by safety hook, 214.
- cable fastenings on, 191.
- cages to be substantially and safely constructed, 216, 230, 241.
- care over, by hoisting engineer, 225.
 - required of, 264.

- clearance of flanges on drum with rope wound up, 190, 242.
- code of signals required, 216, 230, 242.

- to be seen by engineer, 191, 242.

- construction of cages, 216, 230, 241.

- drum attached, 190, 242.

- provided with flanges, 214, 216, 230, 242.

- duty as to hoisting or lowering of men, 264.

- of hoisting engineer as to, 225, 226.

- equipment of cages, 216, 230, 241.

- excessive rate of speed of cage, liability of operator for injury, 265.

- flanges to drum required, 190, 216, 230, 242.

- four persons only to be lowered in bucket, 214.

- general equipment, 190, 191, 240.

- guides required for bucket or cage, 214.

- hoisting cables, secured to drum, 191, 242.

- indicator for use of engineer, 216, 230, 242.

- to show position of cage, 191, 242.

- lights at shaft, purpose, 264.

- location of engine and boiler house, 190.

- mine manager's duty as to, 224, 237.

- operation by engineer, 190.

- persons not to ride on loaded bucket, 214.

- posting code of signals, 216, 231, 242.

- rope fastenings to be secured, 216, 230, 242.

- socketed and resocketed, 230, 242.

- safety appliances required, 216, 230, 241.

- in sinking shafts, 214.

- signals on cages, 216, 230, 241.

- system required for, 216, 230, 242.

- violation of statute, not proximate cause of injury, no liability, 265.

HOISTING ENGINEER.

See also *Cages, Certificates, Coal-mine operator, Hoisting and hoisting equipment, Inspection and examination of mines, Mine manager, Mining operations, Shafts*

- affidavit as to matters for examination, 63, 70, 78, 84.

- age of, for employment, 143.

- applicants for certificates of competency as, 63, 69, 73, 79, 85.

- examination before examining board, qualification and proof, 63, 69, 73, 79, 84.

- must prove age and citizenship, 63, 69, 73, 79, 85.

- proof of character and habits, 63, 69, 73, 79, 84.

- cages in charge of competent engineers, 130, 134, 143, 157.

HOISTING ENGINEER—Continued.

- care of boilers and engines, 195, 225.
 - over hoisting apparatus to be exercised, 195, 225.
- certificate as prima facie evidence of competency, 261.
 - fee, 65, 73.
 - not conclusive evidence of competency, 264.
 - of competency before employment, 56.
 - good character, 56, 65, 70, 73, 84.
 - qualification required, 54, 55.
- certificated engineers only to be employed, 64, 69, 74, 80, 86.
 - hoisting engineer to be employed, 64, 69, 73, 80, 86.
 - only in charge of engine, 211.
- charges as basis of cancellation of certificate, 76, 74, 81, 86.
- cleaning and inspecting boilers and engines at frequent intervals required, 195, 225.
- coal mine operator's knowledge of incompetency, 175.
 - operator may discharge at any time, 238.
 - to employ other than certificated, 69, 74, 80, 86.
- code of signals to be seen by, 191.
- competency and qualification, 54-56.
 - of, effect of certificate, 261.
- competent, experienced and sober required, 130, 134, 143.
 - persons presumed to be certificated, 258.
- conditions required for employment of, 130, 134, 143.
- constant attendance at engine or boiler when miners are working, 195, 225.
- credentials required, 65, 70, 72, 84.
- discharge, 263.
- duties of, 195, 225.
- duty of mine operator to employ, 174, 263.
- employment of certificated only, 69, 74, 80, 86.
 - hoisting engineers uncertificated prohibited, 64, 74, 80, 86.
 - incompetent, willful violation of statute, 264.
 - uncertificated engineer subject to approval of mine inspector, 64, 74, 80, 86.
 - in an emergency, 64, 76, 74, 80, 86.
 - time limited, 70, 74, 80, 86.
 - prohibited unless certificated, 64, 74, 80, 86.
 - without certificate, liability, 56.
 - prohibited, 56.
- examination and employment, 54-56.
 - as to care and adjustment of hoisting engines, 63, 73, 79, 85, 225.
 - efficiency of pumps, ropes, etc., 63, 73, 79, 85.
 - experience in handling hoisting machinery, 63, 73, 79, 85.
 - with hoisting machinery, 69, 73, 79, 85.
 - knowledge of construction and care of steam boilers, 63, 73, 80, 86.
 - hoisting engines, 69, 73, 79, 85.
 - laws relating to signals and hoisting and lowering men, 63, 69, 73, 79, 80, 85.
 - pumps, ropes and winding apparatus, 69, 73, 79, 85.
 - steam boilers, 69, 73, 80, 86.
 - by board of examiners, 56.
 - fee, 65, 73.
 - for certificate, 54, 55.
- experience as fireman or engineer of hoisting plant, 63, 73, 79, 85.
 - in coal mines, 54-56.
 - of applicants as firemen or engineer, 69, 73, 85.
 - necessary to employment, 130, 134, 143.
- experienced persons employed in emergency, 70, 74, 80, 86.
- fireproof construction of engine house, 190.
- handling of engine by strangers prohibited, 195, 226.
- incompetency, knowledge of mine operator, 175.
- knowledge of signals required, 195, 226.
- liability of mine operator for incompetency or negligence of, 175.
 - * operator for acts of, 261.
- negligence of, recovery by injured miner, 335.
- not certificated, subject to approval of mine inspector, 64, 74, 80, 86.
 - fellow servant with miner being lowered and raised, 266.
- notice of duties to be posted on door of engine house, 195.
- operation of engine by noncertificated engineer prohibited, 195, 226.
 - persons learning permitted, 195, 226.

HOISTING ENGINEER—Continued.

- outsiders excluded by, 195, 225.
- proof as to character and habits, 63, 73, 78, 84.
- of incompetency in action by injured miner, 264.
- registration with secretary of board, 65, 78, 84.
- reports of defective machinery to be made, 195.
- signals, must be known by, 195, 226.
- speed of cage regulated, 195.
- statute as guaranty of competency of, 258.
- temporary engineer, employment approved by mine inspector, 70, 74, 80, 86.
- time limited for employment of uncertificated, 70, 74, 80, 86.
- uncertificated hoisting engineers employed in emergency, 70, 74, 80, 86.
- unlawful to employ other than certificated hoisting engineer, 64, 69, 74, 80, 86.
- willful failure to obey statute, liability of operator, 308.
- without certificates may be employed in an emergency, 64, 69, 74, 80, 86.

HOISTING SHAFT.

See Shaft.

I**ILLINOIS MINERS' AND MECHANICS' INSTITUTE.**

See Miners, Miners' institutes.

INDICATOR.

See Cages, Hoisting engineer, Hoisting and hoisting equipment.

INDUSTRIAL BOARD.

- See also Workmen's compensation act.
- address for purpose of notice, 457, 458.
- adoption of rules, 454.
- appeal from decision, questions reviewed, 435, 436.
- to Supreme Court, 457.
- appointment and qualification, 453, 454.
- of physician to examine injured employees, 456.
- arbitration as to compensation, procedure, 455.
- review by Industrial Board, 435, 436, 456.
- arbitrators appointed by, 455.
- bond required for writ of certiorari, 457.
- certified copy of decision presented to circuit court, 458.
- committee of arbitration, appointment and duties, 455.
- compensation of employees fixed by board, 455-456.
- conclusiveness of finding, 435, 436, 457.
- controversies between employee and employer, determination by board, 455-457.
- cost and attorney's fees recoverable, 458.
- creation and appointment of members, 453, 461.
- death of employee, effect on proceedings, 459.
- decision as conclusive, 457.
- confirmed or set aside by circuit court, 457.
- of arbitrator or committee filed with board, 455.
- of majority, 458.
- duties and powers of arbitrator or committee of arbitration, 454.
- under workmen's compensation act, 454-457.
- employees of board, 455.
- employer to file verified statement of financial ability, 461.
- hearings before arbitrator or committee, 456.
- judgment of circuit court on decision of, 457.
- jurisdiction of, 435, 436, 454-457.
- notice of employer's failure to comply with statute, 460, 462.
- filing decision, 455.
- proceedings, 456, 457.
- payment of expenses, 455.
- place of hearings and notice, 456.
- power to require employer to furnish security, 462.
- powers under workmen's compensation act, 454-456.
- procedure before board, 454.
- circuit and supreme courts, 457-458.
- for writ of certiorari, 457.
- reasonableness of rules presumed, 454.
- record of proceedings, 457.

INDUSTRIAL BOARD—Continued.

- review by circuit court, procedure, 457.
 - costs and fees, 458.
 - of decision by suit in chancery, 457.
 - proceedings by court, 435, 436, 457, 458.
 - procedure, 457, 458.
 - where compensation is payable in installments, 458.
- rules, prima facie reasonable, 454.
- salaries of arbitrators, 454.
 - members, 454.
- seal required, 454.
- stenographer provided, 455.
- taking of testimony, 455.
- witnesses, attendance required, 454.
- writ of certiorari, 457.
 - error, 457.

INSPECTION AND EXAMINATION OF MINES.

- See also Boilers, Coal mines, Hoisting and hoisting equipment, Haulageways, Passageways, Shafts, Ventilation.
- affidavit as to matters for examination, 65, 70, 72, 79, 84.
- anemometers used, 75, 82, 88, 144.
- annual survey required, 50, 188, 208.
- application to surface machinery and equipment, 254.
- authority for, must be shown on demand, 75, 81, 88.
- boiler inspection, 191, 217, 231.
- burden by daily inspection not imposed, 171, 172.
- by certified examiner, liability of operator for mistakes, 254.
 - county inspector, 135.
 - State inspector, 75, 82, 88, 145.
- certificate of, by mine manager, 163.
 - pit committee, 163.
- coal-mine operator liable for fees for, 163.
 - punished for refusing, 76, 83, 89.
 - required to furnish facilities, 131.
- complaint of adjoining landowner for, 60.
 - to have examiners appointed, 60, 61.
- condition of mine, statement of, to be posted, 164.
- contents of notice of, 76, 83, 89.
- conviction for failure to have survey, 50, 188, 208.
- copy of record of, filed with Bureau of Labor Statistics, 163.
- cost and expenses, 60, 61.
- county inspector must show written authority on demand, 75, 81, 88.
- court may order, on application, 76, 83, 89, 145.
- daily examination with safety lamp, purpose and application, 170, 171.
 - inspection, extent and application of statute, 254.
 - of shafts required, 243.
 - record of examinations to be kept, 196, 206.
- danger notices to be posted, 196, 205.
- dangerous condition, abstract of decisions, 282-297.
 - provisions relating to, 282, 297.
 - places to be marked by mine examiner, 195, 203, 205.
- discretion of inspectors, 171.
- duty of inspector to enter and inspect coal mines, 131, 145, 149, 154.
 - mine examiners as to, 195, 203, 205.
 - managers as to, 195, 203, 205.
 - miner to examine record of, 181.
- examination by employee not compliance with statute, 255.
 - in case of accident or death, 130, 135, 145.
- extent of, by mine manager, 254.
 - compliance with statute, 254.
- facilities for inspection furnished by operator, 76, 82, 89, 131.
 - refused by operator, 76, 82, 83, 89.
- failure of coal-mine operator to cause, willful violation of statute, 177.
 - furnish facilities for, 76, 82, 83, 89, 131.
 - make daily, liability, 170, 171.
 - permit, 131.
 - to make, not proximate cause of injury, 170, 171.

INSPECTION AND EXAMINATION OF MINES—Continued.

- fees for, 163.
 - inspection not in violation of constitution, 169.
 - of inspectors, 171.
- four annual inspections required, 163.
- frequency of, inspector's discretion, 172.
- fund for, payment of, 163.
- includes engines and appliances at top of shafts, 255.
- inspection at reasonable times, 76, 82, 89, 145.
 - by day or night, 60, 76, 82, 89, 145.
 - fees as compensation for inspection of mines, 169.
 - not taxes, 169.
 - fund provided, 163.
 - not to obstruct working, 76, 82, 89, 145.
 - of boilers every six months required, 243.
 - refused by coal-mine operator, 131.
- instruments for, furnished by mining board, 75, 82, 88, 144, 149, 154.
 - inspector, 193.
 - used in making, 75, 82, 88, 144, 149, 154.
- judge of court to appoint examiners, 60, 61.
- marking dangerous places by mine examiner required, 195, 203, 205.
- mine examiner's duties limited to examination of underground workings, 202.
- manager's duties as to explosives, 194.
 - hoisting apparatus, 195.
 - ventilation, 194, 195.
 - as to, 194, 195.
 - qualifications indicated by examination required, 204.
- miners not required to search for record of, 781.
 - to be excluded until conditions are safe, 131.
- notice of, contents, 76, 83, 89, 164.
 - dangerous places to be posted, 196, 205.
 - to be posted, 76, 83, 89, 164.
- number of inspections depend on varying conditions, 171.
 - required, 171.
 - not dependent upon fees of inspector, 171.
 - required, 163.
- of coal mines and machinery, 76, 82, 89, 145.
- order of court for, 76, 83, 89, 145.
- owner shall permit, 60, 61.
- payment for instruments used, 75, 82, 88.
 - of fees for, 163.
- penalty for hindering or obstructing, 60, 61.
- personal examination of mines required, 75, 82, 88, 144, 149, 154.
- place of posting notice of inspection, 76, 83, 89.
- police power exercised as to, 169.
- posting notice of, 76, 83, 89, 164.
- procedure for, to prevent trespass, 60.
 - in case of objection by operator, 76, 82, 83, 89.
 - where mine operator violates statute for, 131, 164, 166.
- punishment of operator for refusing, 76, 83, 89.
- reasonable times for inspection, 131, 145.
- record of, 163.
- required for health and safety of miners, 169.
- requirement as to improvements, 76, 83, 89.
 - not in violation of constitution, 169.
 - for payment of fee for, not unconstitutional, 169, 170.
- shafts in process of sinking to be inspected, 188.
 - weekly inspection required, 190, 217, 222.
- showing refusal of operator to permit, 76, 82, 83, 89.
- State inspector enforcing penalties, 76, 82, 88, 164, 166.
- statement of condition of mine to be posted, 164.
- supplies for inspection to be furnished by mine owner, 75, 82, 88, 144.
 - to be furnished inspector, 193.
- survey to prevent mining over time, 60.
- time for filing record of, 163.
- times for making, 163.
- unreasonable, not imposed, 172.
- ventilation, requirements as to, 219, 220, 222, 223, 224.
- written authority must be produced, 75, 81, 88.

INSPECTION DISTRICTS.

See also Mine inspectors.

- appointment of inspector for, 66, 68, 74, 81, 87, 148, 153.
- authority to increase not given commissioners of labor, 204.
- boundaries of, 191, 201.
- change of boundaries, 192, 201.
- counties in each, 148, 153, 162, 163, 191, 192.
- division of State into, 66, 68, 74, 81, 87, 148, 153.
- by commissioners of labor, 204.
- five inspection districts, 148, 153.
- governor to appoint seven inspectors, 163.
- inspectors appointed for each district, 66, 68, 74, 81, 87, 148, 153, 163.
- no authority to increase, 192, 201.
- seven required in State, 162, 191.
- State divided into inspection districts, 66, 68, 74, 81, 87, 148, 153, 163.
- seven districts, 162, 191.
- ten districts, 66, 68, 204.
- ten inspection districts required, 66, 68, 204.
- twelve inspection districts, 74, 81, 87.

INSPECTION FUND.

- See also Coal-mine operator, Mine inspectors.
- amount of inspection fee, 163.
- Bureau of Labor Statistics, duties as to 163.
- coal-mine operators to pay fees as, 163.
- fees collected for, 163.
- inspection fees held by Bureau of Labor Statistics as, 163.
- payable quarterly, 163.
- provisions for creation, 163.
- regulation of fees for inspection, 163.

J

JUDICIAL NOTICE.

- courts take, of slate and rock over coal veins, 170.

L

LAWS.

See Statutes.

LEAD.

- See also Minerals.
- act regulating purchase and sale of lead mineral, 57.
- contents of records of purchase and sale, 57, 58.
- inspection of records of sale, 57, 58.
- penalty for violating act regulating sale, 57, 58.
- purchase from children prohibited, 57, 58.
- records of sales and purchases, 57, 58.
- return of purchase to nearest smelter, 57, 58.
- sales regulated, 57, 58.
- violation of act regulating sale, 57, 58.

LEGISLATION.

See Mining statutes.

LEGISLATURE.

- See also Constitution, Mining statutes, Police power.
- carrying out constitutional requirements for protection of miners, 248.
- classification of miners for legislation, 248.
- mines as basis for legislation, 167, 168.
- discretion as to laws protecting miners, 3.
- in classification of mines as basis of legislation, 168.
- duty to enact laws protecting miners, 3.
- pass laws for protection of miners, 3.
- exercise of police power as to inspection of mines, 169.
- laws for protection of miners required by constitution, 3.
- power to classify coal mines, 168.
- require appliances for safety in coal mines, 168.
- construction of shafts, 168.
- maps of coal mines, 168.
- operator to pay inspection fees, 169.
- ventilation, 168.

LIGHTS.

See also Coal cars, Haulageways, Hoisting and hoisting equipment, Mining operations, Passageways, Shafts, Signals.

application to persons working in mine, 266.

at landings, number of men immaterial, 264.

bottom of shaft as a landing, 267.

must be lighted, 268.

coal cars to be equipped with, application and meaning of statute, 270.

duty of operator to furnish, at shaft, 266.

to maintain on front car of trip, 270.

failure of operator to furnish, at bottom of shaft, 266.

proof of other failures, 267.

proximate cause of injury, question of fact, 266.

violation of statute, 304.

willful violation of statute, 267.

maintained at top and bottom of shaft, 200, 215, 230, 241.

mine manager's duty to maintain at landings, 224, 237, 241.

miner entitled to protection of statute, 267.

purpose of requiring, at shaft, 264.

required on landings, 200, 215, 230, 241.

trips of cars, 198, 210, 221, 243.

sufficiency and proof, question of fact, 267.

question of fact, 266.

sufficient, at bottom of shaft, 200, 215, 230, 241.

M**MAIN SHAFT.**

See Shaft.

MAPS.

See also Coal mines, Coal-mine operator, Mine inspectors, Mining operations, Survey.

abandoned mines shown by, 188, 208, 213, 240.

accompanying geological reports, 19.

amendments and corrections required, 50, 128, 141, 147, 159, 188, 208, 213, 240.

annual surveys shown by, 188, 208, 213, 240.

certificate as to accuracy required, 187, 207, 212, 239.

coal-mine operator required to make and file, 50, 128, 141, 147, 159, 187, 207, 212, 238.

seams shown by, 187, 207, 213, 239.

colors and characters showing localities of geological formation, 20.

contents of, where oil well is drilled into coal seam, 357.

conviction of mine operator for failure to make, 50, 128, 141, 147, 158, 188, 208, 213, 214.

copies deposited with inspector and county recorder, 187, 207, 213, 239.

furnished manager of mine rescue station, 213, 239.

not to be made without written consent of operator, 213, 239.

crime for operator's failure to make, 188, 208, 213, 214.

deposit with mine inspector, 128, 141, 147, 159, 187, 207, 213, 239.

dip of coal seam shown by, 187, 207, 212, 238, 239.

duty of State geologist as to, 19.

expense of mine owner, 50, 128, 141, 147, 159, 188, 208, 213.

geological, of State, 19.

index of, required, 213, 239.

legislature may require preparation of, 168.

making and filling required of oil well drilled in coal seam, 357.

matters to be shown by, 187, 207, 212, 213, 238.

mine inspector to make of, coal mines, 50, 128, 141, 147, 159, 188, 208, 213.

objects on the surface shown, 187, 207, 212, 238, 239, 240.

of workings of coal mine, 50, 128, 141, 147, 159, 187, 207, 212, 238.

oil wells drilled in coal seam, map to be filed, 357.

open to examination, 188, 208, 213, 239.

outline of areas in which pillars have been drawn to be shown, 213, 239.

penalty for failure to make, 50, 128, 141, 147, 159, 188, 208, 213, 214.

recorder shall index, 213, 239.

scale of, 187, 207, 212, 238.

separate for surface, 187, 207, 212, 239.

shafts and openings shown by, 187, 207, 212, 239.

special surveys extended on, 188, 208, 213, 240.

surface, required, 212, 239.

survey shown by, 187, 207, 212, 239.

MAPS—Continued.

- survey of coal mines shown by, 50, 123, 141, 147, 159, 187, 207, 212, 239.
- time of making amendments and extensions, 141, 147, 159, 188, 208, 213, 240.
- underground workings shown, 187, 207, 212, 239.
- worked out mines shown by, 188, 208, 213, 240.

MINE ACCIDENTS.

- See also Burying dead miners, Coal-mine operator, Coroner, First aid, Mine fire-fighting equipment, Mine-fire fighting and rescue stations, Mine inspectors, Mine rescue work, Mining operations.
- absent owner not liable for failure to give notice of, 136.
- bandages, blankets, oils, and stretchers to be kept at mine, 227, 228.
- burying dead miners, 1.
- cost of investigation by mine inspector, 227.
- duty of Department of Mines as to, 438.
 - person in charge of mine to give notice of, 130, 135, 136, 143, 148, 227.
- examination as to causes, 131, 143, 148, 227.
- failure to give notice of, fine and imprisonment, 130, 135, 144, 148.
- inspector to give information of to State geologist, 131, 135, 144, 148.
 - investigate, 131, 143, 148, 227.
 - make recommendations as to legislation, 131, 135, 144, 148.
 - report to governor, 131, 143, 148.
 - to State mining board, 227.
- notice of, by person in charge, 136, 143, 148, 227.
 - required, 130, 135, 136, 143, 148, 227.
- "owner or agent" not liable for failing to give notice of, 136.
- penalty for failure to give notice of, 130, 135, 144, 148.
- "person in charge" must give notice of, 136, 143, 148, 227.
 - of mine liable for failure to give notice, 136, 144, 148.
- report of inspector to governor, 131, 143, 148.
 - to State mining board, 227.

MINE EXAMINER.

- See also Certificates, Coal mines, Examination of miners, Inspection and examination of mines, Miner's examining board, Mining operations, Mining statutes, Ventilation.
- additional, may be required by mine inspector, 224, 237, 244.
- affidavit as to matters for examination, 65, 70, 72, 78, 84.
- air currents to be examined before miners enter, 195, 203, 205, 225, 238, 244.
- measurements to be noted in book kept for that purpose, 225, 238, 244.
- anemometer to be used by, in measuring air, 225, 238, 244.
- application of statute to, 262.
- bar for sounding roof to be carried, 225, 238, 244.
- book to be kept for daily record of examinations, 196, 206, 225, 238, 244.
 - entry of report, 223, 236, 244.
- cancellation of certificate, 70, 74, 81, 86.
- certificate as fire boss exchanged for examiner's, 64, 65, 86.
 - prima facie evidence of competency, 261.
 - fee, 65.
 - of character and habits, 65, 70, 72, 79.
 - competency, condition of employment, 64, 80, 85.
 - fire boss exchanged for mine manager's certificate, 64, 65, 86.
 - good character, 65, 72, 79, 84.
 - to, from commission as to first aid to injured, 79, 85.
 - mine rescue methods, 79, 85.
- certificated, not required for examination of night shift, 223, 236.
- charges as basis of cancellation of certificate, 70, 74, 81, 86.
- coal-mine operator may discharge at any time, 258.
 - to employ certificated, only, 70, 73, 80, 86, 244.
- competency of, effect of certificate, 261.
- competent persons presumed to be certificated, 258.
- contents of report as to conditions in mines, 172, 245.
- contributory negligence of, prevents recovery, 336.
- credentials required, 65, 70, 72, 78, 84.
- daily record of conditions of mine required, 196, 206, 225, 238, 244.
 - visit to bottom of shaft, 243.
- danger marks not to be made on face of coal, 225, 238, 244.
 - notices to be posted by, 196, 205, 244.
 - obstructions placed across roadways, 225, 238, 244.
- dangerous conditions, duty to report to mine manager, 262.
 - failure to mark, liability of operator, 266.

MINE EXAMINER—Continued.

- date of examinations to be chalk marked at dangerous places, 196, 204, 205, 225, 238, 244.
on walls, 196, 204, 205, 225, 238, 244.
- definition of, 202, 229.
- duties as to ventilation, 225, 238.
 - limited to examination of underground workings, 259.
 - of 196, 203, 205, 225, 238, 244, 254, 259.
 - can not be delegated to others, 260.
 - to examine workings of mine each day, 259.
- employee not certified can not act as, 255.
- employment of additional, on written order of inspector, 224, 237, 244.
 - uncertified, approval by mine inspector, 70, 73, 80, 86.
 - in emergency, 70, 73, 80, 86, 223, 236.
 - prohibited, 70, 73, 80, 86.
 - time limited, 70, 73, 80, 86.
 - required by statute for safety of miners, 257.
 - unlawful unless certificated, 64, 73, 80, 86.
 - without certificate illegal, 262.
- entrance checks of miners to be taken by, 225, 238, 245.
 - to be delivered to mine manager, 225, 238, 245.
- examination as to experience in mines generating gases, 64, 73, 80, 86.
 - knowledge of fire damp, 64, 73, 79, 85.
 - first aid to injured, 79, 85.
 - laws of State against fires, 64, 73, 79, 85.
 - structure and use of safety lamps, 64, 73, 79, 85.
 - knowledge of mine-rescue methods, 79, 85.
 - ventilation, 64, 73, 79, 85.
- fee, 65.
- of falls and gobs, 225, 238.
 - mine and report before miners enter mine, 223, 236.
 - recent falls, 196, 203, 205, 244.
 - underground workings within eight hours preceding work, 238, 244.
 - twelve hours preceding work, 235.
- exchange of certificate for mine examiners', 64, 65.
- experienced miner employed as, in emergency, 70, 73, 80, 86.
- failure to inspect and mark dangerous places on the surface, violation of statute, 255.
 - mark dangerous place, liability of operator, 263.
- fire bosses' certificates, exchanged for mine manager's, 64, 65.
 - certificates exchanged for examiners' certificates, 64, 65.
- good faith examination, liability of operator, 254, 255.
- grounds for cancellation of certificate, 70, 74, 81, 86.
- indictment for failure to mark dangerous place, sufficiency, and proof, 236.
- inspection of traveling ways for obstructions required, 196, 196, 203, 205, 225, 238, 244.
- knowledge of first aid to injured, 79, 85.
 - mine-rescue methods, 79, 85.
- liability of operator for act of, 261.
 - mistakes of, 264.
- marking dangerous conditions on wall, 233, 233.
 - conditions or places, 232, 233.
 - places required, 196, 204, 205, 225, 238, 244.
- measurements and records of air currents required, 196, 203, 205, 225, 238, 244.
 - of air currents required before miners enter, 196, 203, 205, 225, 238.
- mine manager employed as examiner, 70, 73, 80, 86.
 - may serve as, 64, 72, 80, 86, 259.
- mistakes of, liability of operator for, 264.
- night examiner, record by, 223, 224, 237.
- not fellow servant of miner, 260.
- notice of danger to be posted by, 196, 205, 225, 238, 244.
- persons charged with examination of condition of mine, 238, 238, 239.
 - workings, 202, 229.
- purpose of employment, 257.
 - statute in requiring employment of, 258.
- qualifications as to knowledge of first aid to injured, 79, 85.
 - mine-rescue methods, 79, 85.
 - of, in absence of certificate, effect, 264.
- record of air currents required, 203, 205, 225, 238, 244.
 - conditions in mine, 172.

MINE EXAMINER—Continued.

- record of condition to be made before miners enter mine, 225, 233.
- daily examinations of mine required, 196, 204, 222, 236, 244.
- as to report as to safe conditions in mine, 172, 245.
- registration with secretary of board, 65, 78, 84.
- report as to obstructions at bottom of shaft, 243.
- in book or printed blanks, sufficiency, 172.
- must show all conditions, dangerous or safe, 172.
- of, 172, 245.
- insufficient, 172.
- required at all mines, 195, 203, 205, 224, 237, 244.
- right to protection of statute, 262.
- rod for sounding roof to be carried, 225, 238, 244.
- safety lamp to be carried in performance of duty, 225, 238, 244.
- statute as guaranty of competency of, 258.
- sufficiency of reports as to safe condition in mines, 172.
- time limited for employment of uncertificated, 70, 73, 80, 86.
- unlawful to employ other than certificated, 64, 70, 73, 80, 86.
- using open light in gaseous mine, no recovery, 336.
- vice principal as to miners, 260, 261.
- violation of statute, evil intent immaterial, 309.
- visit to mine before miners enter, 193, 203, 205, 223, 225, 226, 228, 244.
- willful failure to comply with statute, operator liable, 260, 268, 269.
- working places, date of examination to be marked on walls, 196, 204, 206, 225, 236, 244.

MINE FIRE FIGHTING AND RESCUE STATIONS.

- See also Maps, Mine accidents, First aid, Mine fire-fighting equipment, Mine rescue work.
- abolished, 438.
- act to establish and maintain, 28, 29.
- amendatory acts, 29, 30, 31.
- appointment of commission for procuring stations, 28, 29.
- station superintendents, 28, 29.
- appropriation for, 29, 32.
- arrangement for efficient cooperation, 28.
- commission for acquiring stations, 28, 29.
- to report to governor, 29, 30, 31.
- cost, equipment and maintenance of station, 28.
- duties of managers of stations, 29.
- in case of accidents in mine, 29, 30, 31.
- of State architect to provide plans for buildings, 28.
- management of, 28, 29.
- managers appointed for stations, 28, 29.
- map of mine to be furnished to manager of, 213.
- office of superintendents abolished, 438.
- personnel of commission, 28, 29.
- purpose, 28.
- rescue work, 29, 30, 31.
- salary of managers, 28.
- station superintendent, 28.
- sites for stations, 28.

MINE FIRE FIGHTING EQUIPMENT.

- See also Coal-mine operator, First aid, Haulageways, Mine accidents, Mine fire-fighting and rescue stations, Mine rescue work, Mining operations, Signals, Stables.
- act to require fire-fighting equipment, 33, 38, 42, 44.
- air and escapement shaft, fireproof construction, 36, 40, 44, 46.
- amendatory acts, 33, 38, 42, 44, 441.
- application to coal mines, 442, 443.
- area at bottom of shafts to be protected, 33.
- for sprinklers, 441.
- arrangement and location of telephone line, 35, 40.
- automatic sprinklers, 33, 39, 42, 45.
- for stable, 442.
- requirements, 441.
- temperature to release water, 34, 39, 43, 45.
- to be provided, 441.
- authority of employees in case of fire, 35, 36.
- barrels of water, location near stables, 34, 39, 42, 45.
- requirements, 442.
- buckets and hand pumps required, 36, 40, 44, 47, 442.
- cage equipped with signal, 35.

MINE FIRE FIGHTING EQUIPMENT—Continued.

- capacity of barrel, 34, 39, 43, 45, 442..
 - chemical fire extinguishers, 34, 39, 43, 45, 442.
- certificate of mine manager revoked, 36, 41.
 - revoked on conviction of crime, 36, 41.
- character of electric bells used in coal mines, 35.
- chemical fire extinguishers in lieu of fire drills, 26, 40, 44, 47.
 - required, 34, 39, 43, 45, 442.
 - requirements as to, 442, 443.
- construction of stables in coal mines, 35, 39, 442.
- conviction for violation of act, 36, 41.
 - of mine manager, certificate invalidated, 36, 41.
- criminal violation of act, punishment, 36, 41.
- danger signal, 35.
- device for cage signal, 35.
- diameter of pipes, 441.
- duties of mine inspector to file complaint on violation of act, 37, 41.
 - report, inspections and violations, 37, 41.
- miners at fire drill, 36, 40.
- electric bells signal, 35.
- gong signal system in coal mine, 35, 40.
- employees in coal mines required to have fire drills, 36, 40
 - shall have graded authority, 35, 36.
- enforcement secured, 37, 41.
- equipment approved by Department of Mines and Minerals, 442, 443.
- escapement shaft, fireproof construction, 36, 40, 44, 46.
- failure of mine inspectors to comply with act, 37, 41.
- feed kept in stables in mine, 35, 40.
- fire drills required, 36, 40.
 - not required, 443.
- fighting equipment, requirements as to, 442, 443.
- fireproof construction of shafts, 36, 40, 44, 46.
 - material required in coal mine, 36, 40, 44, 46.
 - used in passageways, 36, 40, 44, 46.
- fire protected area, 33, 441.
- general provisions, 441.
- gong, construction and location, 36.
- hand pumps required in coal mines, 34, 39, 43, 46, 442.
- hoisting shaft, fireproof construction, 36, 40, 44, 46.
- horn for cage signal, 35.
- hose connection with water supply, 33, 38, 42, 45, 441.
- lights used in stables in coal mine, 35, 40.
- location of automatic sprinklers, 34, 38, 43, 45, 441, 442.
 - stables, 35, 39, 443.
- miners to leave mine in case of fire or danger, 36.
- operation of telephone lines, 35, 40.
- pipes for supplying water, 33, 38, 42, 45, 441.
- pump buckets required, 36, 40, 44, 47, 442.
- purpose, 33, 34, 441.
- quantity of feed kept in stables in coal mine, 35, 40.
- requirement as to hose and nozzle, 33, 38, 42, 45, 441.
- rescue work in case of, 28-31.
- roof of passageway to be fireproof, 36, 40, 44, 46.
- signals to be given in case of danger, 36.
- size of hose, nozzles, and pipes, 33, 38, 42, 45, 441.
- stables in coal mine, fireproof construction, 36, 40, 44, 46.
 - fire protection, 34, 39, 43, 46.
 - location, 44, 46, 443.
- standard of iron pipe, 33, 441.
- supply of hose, 440, 441.
 - water for fighting fire, 441.
- system of danger signals, 35.
- telephone lines required, 35, 40.
- violation of act, conviction and punishment, 36, 41.
 - duty of inspectors, 37, 41.
 - mine fire-fighting equipment act, 36, 41.
- water pressure in pipes, 34, 38, 42, 45, 441.
 - supply, 33, 38, 42, 44, 441.

MINE FOREMAN.

See also Certificates, Examination of miners, Mine managers, Miners' examining board, Examination of miners, Mining operations.
 certificate of competency required for employment, 54.
 examination required, 54, 55.
 qualification for certificates, 54, 55.

MINE INSPECTION.

See Inspection and examination of mines, Mine inspectors, Survey of mines.

MINE INSPECTORS.

See Cages, Certificates, Coal mines, Coal-mine operator, County inspector, County surveyor, Haulage-ways, Hoisting and hoisting engineers, Inspection and examination of mines, Maps, Miners' examining board, State mining board, Mining operations, Mining statistics, Shafts, Ventilation.
 accident blanks to be furnished by for record, 199, 245.
 accidents in mines, duties of, 199, 227, 245.
 record of inspection required, 200, 227, 245.
 action for enforcement of penalties, 76, 82, 88.
 acts relating to, 48, 49, 50.
 requiring information to geologist repealed, 164.
 special survey of mine, 50, 128, 141, 147, 159, 188, 208.
 affidavit as to matters for examination, 65, 70, 72, 79, 84.
 showing refusal of operator for inspection, 76, 82, 83, 86.
 age of, 149, 153.
 amount of bond and surety, 75, 82, 88, 149, 154, 192.
 anemometers furnished, 192.
 used in inspection of mines, 75, 82, 88, 144.
 annual report, 76, 83, 89, 145, 149, 154.
 to Bureau of Labor Statistics, 149, 154, 193.
 governor of mine accidents, 131.
 survey of mines required, 50, 128, 141, 147, 159, 188, 208.
 applicants must produce evidence of citizenship and age, 68, 72, 79, 84.
 appointed by governor, 148, 153.
 for each inspection district, 66, 68, 73, 74, 81, 88.
 appointment by board of supervisors, 75, 81, 87, 135, 144.
 commissioners, 75, 81, 87, 144.
 county boards, 75, 81, 87, 135, 144.
 from names certified, 68, 72, 74, 81, 84, 148, 153.
 of assistant county inspector, 164.
 county inspector of mines, 75, 81, 87, 144.
 successor to removed inspector, 74, 81, 86, 144.
 to fill vacancy on removal of, 194.
 appropriations for, 50-53, 91.
 mine instruments, 52, 53.
 payment of salaries, 51, 52, 53.
 approval of magazines for storing explosives, 18.
 assistant county inspector appointed on request, 164.
 duties, 164.
 to state inspector, 75, 81, 87.
 authority conferred on county inspector, 75, 81, 88.
 in relation to permissible explosives, 18.
 of county inspector conferred in writing, 75, 81, 87.
 inspector over ventilation, 197, 207, 219, 220, 234.
 to county inspectors, 194.
 enter and inspect coal mines, 76, 82, 89, 192.
 sample black blasting powder, 17.
 blanks to be furnished State mining board, 76, 83, 88, 149, 154.
 bond approved by governor, 75, 82, 88, 149, 154, 192.
 covers acts of county inspector, 75, 82, 88.
 deposited with secretary of state, 192.
 filed with secretary of state, 75, 82, 88, 149, 154, 192.
 of, includes duties of county inspector, 194.
 required, 75, 82, 88, 144, 149, 154, 192.
 to county board required, 135, 144.
 cages used for carrying men, speed, 76, 83, 89.
 causes for removal, 74, 81, 86, 144, 193.
 certificate of character and habits, 65, 70, 72, 79, 84.
 competency as mine manager required, 76, 81, 84.

MINE INSPECTORS—Continued.

- coal mine owner may be required to pay for inspection, 170.
- miners may petition for removal, 74, 81, 86, 144.
- operators may petition for removal, 74, 81, 86, 144.
- commissioners of labor may remove for cause, 193, 194.
- comparison of air measures with report of mine examiner, 75, 82, 88.
- compensation fixed by county board, 75, 81, 87, 144.
 - of, 77, 83, 89, 149, 154, 164, 193.
 - assistant county inspectors, 164.
 - county inspector, 75, 81, 87, 135, 144.
- conditions of bond, 75, 82, 83, 144, 149, 154, 192.
 - mine, statement of, to be posted by, 164.
- consent of as to speed of cage, 200.
- contents of annual report to Bureau of Labor Statistics, 149, 154.
 - State mining board, 76, 83, 89.
 - statement of condition of mine, 164.
- conviction for failure to have coal mines surveyed, 50, 128, 141, 147, 159.
- copy of record of inspection filed with Bureau of Labor Statistics, 163.
- correction of map, 50, 128, 141, 147, 159, 188, 208, 213.
- costs of investigations of mine accidents, 130, 135, 200.
 - investigation of mine accident by, 227, 245.
- maps, 50, 128, 141, 147, 159, 188, 208, 213.
- county inspector appointed to assist State inspector, 75, 81, 87, 149, 194.
 - authorized by State mine inspector, 75, 81, 83, 194.
 - must show authority on demand, 75, 82, 88.
 - of mines, 75, 81, 87, 144.
 - paid from county treasury, 75, 81, 87, 144.
 - surveyors as ex officio, 130, 136.
- credentials required, 65, 70, 72, 78, 84.
- determination of air quantity, 75, 82, 88.
- dip of coal stratum, duty to determine, 48, 183, 208.
- discretion as to number of inspections, 171, 172.
 - in directing air currents, 156, 161.
 - of, 171.
- duty as to code of signals, 75, 82, 83, 192.
 - maps, 128, 141, 147, 159, 188, 208, 213.
 - payment of miners' wages, 100.
 - record of inspection, 163.
 - mineral strata, 43.
 - tabulation of coal lands and coal beds, 131, 145, 149, 164.
 - test weights, 49.
 - ventilation, 156, 161, 196, 206, 446.
 - weighing coal, 48, 49.
- at coroner's inquest, 199, 227, 245.
- in case of accident, 199, 227, 245.
 - examination of mines, 75, 82, 88.
 - relation to escapement shafts, 189, 190.
 - mine fire fighting, 37, 41.
- of county inspector, 75, 81, 87, 144.
 - respective officers, 75.
 - State inspector as to appointment of county inspector, 82.
- on discovery of violation of laws, 135.
 - failure of coal-mine operator to permit inspection, 131.
 - finding violation of laws upon inspection, 131.
 - receiving report of accident, 199, 227, 245.
 - violation of statute by operator, 202, 209, 238.
- relating to black powder for use in coal mines, 17.
 - mining laws, 76, 82, 83, 228.
 - permissible explosives, 18.
- to adjust scales, 49.
 - enter and inspect coal mines, 131, 145, 149, 154.
 - furnish information to geologist, 43.
 - statistics, 76, 83, 89, 145, 149, 154.
 - inspect and test scales in coal mine, 48, 49.
 - mining machinery, 131, 145, 149, 154.
 - investigate mines in case of accident or death, 120, 136, 146, 246.
 - post result of inspection, 76, 83, 89.

MINE INSPECTORS—Continued.

- duty to, report to Bureau of Labor Statistics annually, 149, 154, 199.
- State mining board annually, 76, 82, 83, 88, 89.
- see that mining laws are observed, 192.
- eligibility for appointment, 67, 68, 72, 75, 79, 84, 87.
- enforcement of penalties for violation of mining laws, 76, 82, 83, 145, 149, 154, 199.
- enforcing code of signals, 75, 82, 88.
- observance of mining laws, 76, 82, 88, 145, 149, 154.
- precaution as to health and safety of miners, 76, 82, 83, 145, 149, 154.
- entire time devoted to duties of office, 75, 82, 88, 149, 154, 199.
- examination of gaseous mines, 75.
- every mine required, 192.
- for certificates of competency, 68, 70, 72, 79, 84.
- of mines as required by State mining board, 75, 82, 83.
- by, 75, 82, 83, 145.
- ex officio inspector of weights and measures, 48, 49.
- expenses allowed and paid, 48.
- and salaries, 50-53.
- of inspectors limited, 77, 83, 89, 150, 155.
- provided for, 49.
- facilities for inspection furnished by operator, 76, 82, 89, 131.
- refused by operator, 76, 82, 83, 89, 131.
- failure of coal-mine operator to furnish facilities for inspection, 131.
- permit inspection, 131.
- to have map of mine made, 50, 128, 141, 147, 150, 199, 208, 213, 214.
- make report, 76, 77, 83, 89.
- fees for inspection, 163.
- not dependent upon number of inspections, 171.
- of, 171.
- four annual inspections of mines required, 163.
- frequency of examinations of mines, 75, 82, 88.
- fund for payment of inspectors, 163.
- hoisting and lowering cages, 76, 83, 89.
- improvements required on inspection, 76, 83, 89.
- incompetency and removal, 74, 81, 86, 144, 150, 154.
- information to be furnished geologist, act repealed, 164.
- geologist as to mine accident, 131.
- inquiry as to qualification, 62, 77, 79, 84.
- inspection at reasonable times, 76, 82, 89, 145, 192.
- by day or night, 76, 82, 89, 145, 192.
- county inspector, 135.
- certified to by mine manager, 163.
- pit committee, 163.
- districts, appointment of inspectors for each, 66, 68, 74, 81, 87, 145, 192.
- not to obstruct or hinder working, 76, 82, 89, 145, 192.
- of black powder for use in coal mines, 17.
- coal mines and machinery, 76, 82, 88, 145, 188, 192.
- facilities furnished by operator, 76, 82, 89.
- machinery, reasonable times for inspection, 192.
- oil required, 354, 356.
- shafts, duty as to, 189, 190.
- in process of sinking, 188.
- inspector for each district appointed by governor, 163.
- means State inspector of mines within his district, 202.
- of weights and measures at coal mine, 48, 49.
- instruments for efficient discharge of duty, 192.
- inspection to be furnished by Bureau of Labor Statistics, 199.
- furnished by State mining board, 75, 82, 88, 144, 149, 154.
- used in examination of mines, 75, 82, 88, 144, 149, 154.
- interest in mine prevents appointment, 68, 75, 81, 87, 144, 149, 192.
- investigation by, in case of accident, 200.
- judgment as to number of men to work, 199.
- knowledge of geology of coal measures, 68, 72, 79, 84.
- laws relating to coal mines, 68, 72, 79, 84.
- mine gasses, 68, 72, 79, 84.
- mining engineering, 68, 72, 79, 84.
- operation of coal mine, 68, 72, 79, 84.
- ventilation in coal mines, 68, 72, 79, 84.

MINE INSPECTORS—Continued.

- legislature has power to appoint, 170.
 - may provide for payment of, 170.
- malfeasance in office, removal, 74, 81, 86, 145, 150, 154.
- maps of survey of mine, 50, 128, 141, 147, 159, 188, 206, 213.
 - to be made by, on failure of operator, 128, 141, 147, 159, 188, 206, 213.
- measurements of air, 75, 82, 88.
- men permitted to ride on cage, 76, 83, 89.
- mine managers may be appointed assistant, 75, 81, 86.
- miners working without air, duty, 156, 161.
- mines examined each six months, 75, 82, 88.
- minimum rating by miners' examining board, 68, 72, 80, 84.
- names certified to governor, 68, 72, 74, 81, 84.
 - of qualified persons certified to governor, 66, 68, 72, 74, 81, 84.
- neglect of duty, removal, 74, 81, 86, 150, 154.
- notice of inspection, contents, 76, 83, 89.
 - requirements as to improvements, 76, 83, 89.
 - to be posted, 76, 83, 89.
- number of men to ride on cage, 76, 83, 89, 192.
- petition for removal, 193.
- to operator of coal mine to adjust scales, 48, 49.
 - insufficient ventilation, 156, 161.
- number of inspections depend on varying conditions, 171.
 - men permitted to ride on cage, 76, 83, 89.
 - reappointments without examination, 74, 81, 87.
- oath of office required, 75, 82, 88, 135, 144, 149, 153, 192.
- office of State mine inspector transferred, 438.
- oils used in mine to be inspected by, 354, 356.
- one inspector for each inspection district, 66, 68, 72, 74, 81, 87, 149, 153.
- operator, interference with duties, liability, 201, 209.
 - to furnish facilities for inspection, 76, 82, 89.
- order of judge of court for inspection, 76, 83, 89, 145, 192.
- payments for instruments used by, 75, 82, 88.
 - of compensation, 164, 193.
 - county inspector from county treasury, 75, 81, 89.
 - salary and expenses, 77, 83, 89, 149, 154, 164, 193.
 - traveling expenses of, 193.
- pay of inspectors, 77, 83, 89, 144, 149, 154, 164, 193.
- penalty for failure to have coal mines surveyed, 50, 128, 141, 147, 159.
 - make map of coal mine, 50, 128, 141, 147, 159, 188, 206, 213.
 - report, 76, 77, 83, 89.
- personal examination of mines, 75, 82, 88, 144, 149, 154.
- persons interested in coal mines ineligible, 68, 75, 81, 87, 149, 154.
- petition for removal, 74, 81, 86, 149, 154, 193.
 - of coal miners for removal of, 193.
 - operators for removal of, 193.
- places of posting notice of inspection, 76, 83, 89, 164, 192.
 - statement of condition of mine, 192.
- posting notice of number of men to ride on cage, 192.
 - rate of speed of cage, 192.
 - statement of condition of mine, 164, 192.
- power to investigate accidents, 200, 245.
 - protect miners in shafts, 241.
- precautions to insure health and safety of miners, 192.
- procedure in case of objection by operator, 76, 82, 83, 89.
 - where operator refuses inspection, 192.
 - mine operator violates statute, 131.
- proceedings for removal, 74, 81, 86, 149, 184.
- proof to county board of experience, 135.
- publication of reports, 76, 83, 89, 164, 193.
- punishment of operator for refusing inspection, 76, 83, 89.
- qualifications and proof, 63, 66, 68, 72, 79, 84, 144, 149, 153.
 - conditions for certificate, 68, 69, 72, 79, 84.
 - of assistant county inspector, 164.
- rate of speed for lowering and hoisting miners, notice of, 192.
 - of cage, 76, 83, 89, 192.
- reappointment without examination, 74, 81, 87.
- reasonable times for inspection, 131, 145, 164, 192.

MINE INSPECTORS—Continued.

- recommendations as to legislation, 76, 83, 89, 131, 145, 149, 154, 193.
- record of investigation in case of accidents, 200.
 - inspections required, 163.
- refusal of operator to furnish facilities for inspection, 76, 82, 83, 89.
 - permit inspection, 76, 82, 83, 89.
- removal, 74, 81, 86, 145, 150, 154, 193.
 - and appointment of successors, 74, 81, 86, 145, 150, 154, 193.
- repeal of act requiring information to geologist, 164.
- report of accidents to, 199, 227, 245.
 - mine statistics, 193.
- required to enforce act for payment of coal miners in money, 109.
- requirements as to posting code of signals, 75, 82, 88.
 - precaution for health and safety, 76, 82, 83, 145, 149, 154.
- reports of examination of mines and violation of mine fire fighting equipment act, 37, 41.
 - inspection of mines, 76, 83, 88, 89, 145, 154.
 - to be published, 76, 83, 89.
 - State geologist, 48.
 - mining board, 76, 83, 88, 89.
- safety lamps, consent for use of other lights, 220, 233.
 - furnished, 192.
 - used in inspection of mines, 75, 82, 88, 192.
- sampling black blasting powder, 17.
- scope of examination of mines, 75, 82, 88, 149, 154.
- shafts, location determined by, 189.
- standard weights for testing scales by, 49.
- State inspector, reappointment without examination, 87.
 - mining board may remove on petition, 74, 81, 86, 149, 154.
 - to compile annual coal report, 76, 83, 89.
- statement of condition of mine, signatures to, 164.
 - to be posted, 192.
- statistics as to mining operations, 131, 145, 149, 154.
 - of mines and miners furnished Bureau of Labor Statistics, 149, 154.
 - State board, 76, 83, 89, 145.
- supplies for inspection to be furnished by Bureau of Labor Statistics, 193.
 - furnished for examination of mines, 75, 82, 88, 144, 149, 154, 193.
- surety on bonds of, approved by governor, 75, 82, 88, 149, 154.
- survey of workings of mines, 50, 128, 141, 147, 159.
- tabulation of facts as to mines and mining operations, 131, 145, 149, 154, 193.
 - mining statistics, 193.
- term of office of county inspector, 135.
- testing black blasting powder, 17.
- test of scales on written request, 49.
 - weights supplied for coal mines, 49.
- time for filing record with Bureau of Labor Statistics, 164.
- to authorize county inspector, 75, 81, 88.
- travelling expenses, allowance and payment, 50, 193.
- unreasonable inspections safeguarded, 172.
- ventilation, authority and duty as to, 219, 220, 233.
- vice principal as to miners, 260.
- violation of act requiring map of survey, 50, 128, 141, 147, 159.
- vouchers for expenses to be sworn to, 193.
- whole time and attention to duties of office, 192.
- written authority of county inspector, 75, 81, 88, 194.
 - request for assistant inspector, 75, 81, 88,

MINE MANAGERS,

- See also Certificates, Coal mines, Examination of miners, Inspection and examination of mines, Mine examiner, Miners' examining board, State mining board, Mine inspectors, Mining operations, Mining statutes, Ventilation.
- acting as mine examiner, 259.
- act providing for examination and employment, 54.
- affidavit as to matters for examination, 65, 70, 72, 78, 84.
- air currents to be measured by, 194, 224, 234, 237.
- anemometers to be used by in measurement of air current, 194.
- applicants for certificates as, 68, 72, 79, 84.
 - for examination before examining board, qualification and proof, 63, 72, 79, 84.
- appropriations for expenses, 50.

MINE MANAGERS—Continued.

- assistants may be employed, 258.
 - permitted, 195, 221, 237.
 - to act under direction of, 259.
- attention to cages and ropes required, 195, 224, 237.
 - handling and storage of explosives in mine required, 194, 224, 237.
- authority over employees and miners, 254.
 - shot firers, 376, 377.
- biweekly visit to working places, 223, 236.
- blasting not permitted by until miners are out of mine, 376, 377.
 - shots, under supervision of, 194.
- bottom man and top man required to be on duty by, 195, 219, 224, 237.
- cages, safety catches, pumps, stables and sumps, to be examined frequently, 106.
- care and oversight of mine required, 195, 223, 224.
 - of safety lamps by, 200, 213.
- careful watch over ventilating apparatus required, 194, 219, 224, 233, 237.
- certificate as condition for employment, 54.
 - prima facie evidence of competency, 261.
 - fee, 65, 72, 79.
 - forfeited for wrongful employment of coal miner, 92.
 - issued by State board of examiners, 55.
 - of character and habits, 63, 70, 72, 79, 84.
 - competency, 54.
 - good moral character required, 63, 72, 79, 84.
 - qualification required, 54.
 - service, 54.
 - character and habits, 63, 72, 79, 84.
 - charges as basis of cancellation of certificate, 70, 74, 81, 86.
 - checking system for miners entering and leaving mine required by, 232, 236.
 - coal-mine operator may discharge at any time, 258.
 - to employ only certificated managers, 64, 69, 72, 80, 86.
 - competency of, effect of certificate, 261.
 - competent person appointed as assistant, 195, 221, 237.
 - presumed to be certificated, 259.
 - contents of certificates, 55, 56.
 - credentials required, 65, 70, 72, 79, 84.
 - cross cuts, required to make for best ventilation, 194, 219, 224, 233, 237.
 - custodian of safety lamps, 201, 213.
 - daily inspection of mine before miners enter required, 195, 223, 237.
 - dangerous places, marking limited to underground workings, 200.
 - to be marked by, 191, 223, 236.
 - danger signals to be displayed, 191.
 - definition of, 202, 223.
 - dusty roads to be sprinkled, 191, 220, 224, 234, 237.
 - duties as to cross cuts for securing ventilation, 194, 219, 221, 233, 237.
 - employment of coal miner, 92.
 - ventilation, 194, 219, 224, 233, 237, 445, 446.
 - in relation to props, 272, 273.
 - measured by requirements for examinations, 254.
 - of, 191, 221, 236, 254, 259.
 - can not be delegated to others, 260.
 - to inspect shafts, 190.
 - make provisions for safety of miners, 167, 195, 231, 236.
 - early and late duty, 195, 221, 237.
 - employees and miners instructed by, 253.
 - employment in absence of certificated manager, 55, 221, 236.
 - coal mine, 54.
 - of certificated only, 60, 72, 80, 86.
 - mine examiner as, 61, 69, 72, 80, 86.
 - uncertificated, approval by mine inspector, 70, 72, 80, 86.
 - in emergency, 60, 72, 80, 86, 233, 236.
 - mine manager, time limited, 70, 72, 80, 86.
 - prohibited, 61, 72, 80, 86.
 - time limited, 70, 72, 80, 86.
 - regulated, 54.
 - without certificate of competency prohibited, 56.

MINE MANAGERS—Continued.

- examination and employment, 54, 55.
 - as to experience in mines, 63, 68, 72, 79, 84.
 - fitness, 54.
 - knowledge of mine gases, 60, 72, 79, 84.
 - mechanism, 62, 68, 72, 79, 84.
 - principles of ventilation, 62, 72, 79, 84.
 - ventilation, 60, 72, 79, 84.
 - properties of mine gas, 68, 72, 79, 84.
 - use of surveying and other instruments, 68, 72, 79, 84.
 - by State board of examiners, 54.
 - fee, 65, 72.
 - of mine examiner's report, 223, 236.
 - mine indicated by qualifications, 254.
 - working places by, in mines, 194, 223, 236.
- fee for certificate, 55.
- examination, 55.
- fire-boss, foreman, hoisting engineer, pit boss, 54.
- "foreman," "mine boss," or "pit boss" same as, 202.
- forfeiture of certificate for wrongful employment of miner, 92.
- frequency of examinations of working place, 194, 223, 236.
- inspection of cages and ropes required daily, 195, 224, 237.
 - shaft each week required, 190, 217, 232.
 - required for night shifts, 223, 236.
- instruction of employees, 194, 224, 237, 258.
- knowledge of dusty roadway, willful failure to obey statute, 300.
- liability of operator for act of, 261.
 - employment without certificate, 55.
- lights to be required at top and bottom landings, 195, 224, 237.
- marking dangerous places, meaning and duty, 282.
- may require employees and miners to obey mining laws, 286.
 - serve as mine examiner, 64, 72, 80, 86.
- means person in charge of underground and outside workings, 202.
- mine boss as, 54.
 - foreman as, 54.
- miners refused entrance checks in case of danger, 223, 236.
 - to be withdrawn when fan stops, 194, 224, 237.
- night shift, permission of, to enter mine, 223, 236.
- not fellow servant of miner, 260, 261.
- person in charge of underground workings, 202, 229.
- pit boss as, 54.
- powers generally, 224, 237.
- practical experience in coal mine, 54.
- presence required when men are lowered or hoisted at shafts, 195, 224, 237.
- providing supply of caps, timbers, etc., 194, 224, 237.
- provisions for safety of miners required, 187, 195, 224, 237.
- purpose of statute in requiring employment of, 258.
- qualifications and experience, 63, 72, 79, 84.
 - eligibility for appointment, 63, 72, 79, 84.
 - for certificates, 54.
 - of applicants for certificates, 68, 72, 79, 84.
- record of certificates, 55, 56.
 - obstructions in roadways to be kept by, 194, 224, 237.
- registration with secretary of board, 65, 72, 79, 84.
- roadways to be inspected each week, 194, 224, 237.
- safety lamps, consent for use of other lights, 220, 233.
- same as "fire boss," 202.
- second-class, affidavit as to matters for examination, 65, 70, 72, 79, 84.
 - applicant for certificate as, 72, 79, 84.
 - certificate of character and habits, 65, 70, 72, 79, 84.
 - credentials required, 65, 70, 72, 79, 84.
 - employment on condition, 72, 79, 84.
 - examination as to experience in mine, 72, 79, 84.
 - knowledge of coal mining, 72, 79, 84.
 - mining laws, 72, 79, 84.
 - mine ventilation, 72, 79, 84.
 - qualifications, 72, 79, 84.
 - when may be employed, 72, 79, 80, 84.

MINE MANAGERS—Continued.

- shot firers, authority over, 376, 377.
- sprinkling dusty roads required, 194, 220, 224, 234, 237.
- standard of qualification, 54.
- statute as guaranty of competency of, 258.
- stoppings required to be made by, along airways, 194, 219, 233.
- temporary employment of uncertificated, 64, 72, 80, 86, 223, 236.
- time limited for employment of uncertificated, 70, 72, 80, 86.
- uncertificated managers employed in emergency, 60, 72, 80, 86, 223, 236.
- underground workings examined by mine examiner, 223, 236.
- unlawful to employ other than certificated mine examiner, 64, 69, 72, 80, 86.
- ventilation, duty as to, 194, 219, 224, 233, 237, 445, 446.
- vice principal as to miners, 260, 261.
- visit to working places biweekly, 223, 236.
- weekly inspection of shafts required, 190, 217, 224, 232, 237.
- what constitutes, 54.
- willful failure to comply with statute, operator liable, 260.
 - obey statute, liability of operator, 308, 309.
- without certificate, not to be employed, 64, 72, 80, 86.

MINERALS.

- See also Geologist, Lead, Salines.
- collection of, in cabinet, 19, 20.
- duty of State geologist as to, 19, 20.
- mineralogical survey of State, 19.
- study of, by bureau of geological survey, 24.
- taxation of, 343, 345.

MINERAL LANDS.

- See also Ditches, Drains and roads, Eminent domain, Geologist, Lead, Salines, Survey of mines.
- act regulating mining upon, 60.
 - purchase of lead mineral, 57, 58.
- coal lands within salines, sale of, 374, 375.
- criminal offense, mining over line, 60, 61.
- drainage, 5.
- governor to sell coal lands within saline reserve, 374, 375.
- mining over line, 60.
 - complaint before judge or court, 60.
 - penalty for, 61.
 - survey of mine to determine, 60.
 - trespass, 60.
- penalty for trespass on, 60, 61.
- procedure to prevent, 60, 61.
- survey of mine to determine, 60, 61.

MINE RESCUE STATION COMMISSION.

- See Mine fire-fighting and rescue stations.

MINE RESCUE WORK.

- See also Coal mines, Mine accidents, Mine fire-fighting and rescue stations, Mine manager, Mining operations.
- accidents in mine, mine manager to attend, 29, 31.
- authority of mine manager in performing, 29, 31.
- certificate by mine examiner as to, 79.
- cooperation in, 29, 31.
 - of mine manager with superintendent, 29, 31.
- duty of manager of station as to, 29, 31.
- manager of station to go to mine on notice of accident, 29.
 - superintend rescue work, 29, 31.
- mine examiner must qualify as to, 79.
- rescue corps in charge of manager of rescue station, 29, 31.

MINERS.

- See also Actions, Assumption of risk, Certificates, Coal-mine operator, Contributory negligence, Examination of miners, Miners' examining board, Inspection and examination of mines, Mine inspectors, Mine managers, Mining operations, Mining statutes, Rules, Shot firers, Workmen's compensation act.
- acting on theory that operator has caused examination of mines, 161.
- action for damages for injuries, abstracts of decisions relating to, 319-327.
 - instances, 319-327.
- death of, 139.
 - by administrator, pleading, 139.
- injury, 184.
 - pleading and proof, 319-327.

MINERS—Continued.

- acts of endangering lives of others, unlawful, 226.
 - relating to competency and employment, 92, 94, 96, 99.
- actual knowledge of dangerous roof, assumption of risk, 183.
- age of employment in coal mines, 281, 282.
- altering checks unlawful, 226.
- application to work in coal mines, 92.
- assumes risks of injury from negligence of fellow miner, 182.
- assumption as to operator's compliance as to reporting dangerous conditions, 172.
 - of risk, 183, 336.
 - that operator has complied with statute, 181
 - performed duty, 263.
- being lowered and raised is not fellow servant with engineer, 265.
- burying dead bodies, duties of mining company, 1.
- care in preparing blasts in coal mine, 151, 222, 235.
 - required in use of explosives and fire, 201, 222, 235.
 - of, 180, 181, 226.
 - with reference to use of props, 181.
- carpenter employed on surface not a miner, 252.
- carrying lamp, lighted pipe, or fire prohibited, 201, 219, 226.
 - lights within 5 feet of explosives unlawful, 226.
 - open light, pipe, or fire into working place unlawful, 226.
- caution as to mining operations, 201, 226.
- certificate as evidence of qualifications, 162.
 - of competency issued on examination, 92, 93, 94, 95, 97, 99.
 - to, not sufficient as shot firer, 102.
- changing checks unlawful, 226.
- chargeable with knowledge of contents of posted notices, 226.
- checked into and out of mine, 223, 226, 236.
- checking system for entering and leaving mine required, 223, 226, 236.
- check weigher employed by, 386, 393.
- classification for legislation, 248.
- coal mined by, to be weighed at mines, 386, 393.
 - mine operator to provide ventilation for, 156, 161.
- compensation for injuries to, violation of statute, 184.
 - under workmen's compensation act, 394, 403, 418, 449-453, 461-468.
- competency and experience, 92, 94, 97, 99.
 - for employment in coal mines, 92.
- compromise of claim may release operator from further liability, 183.
- conditions for employment of uncertificated, 101.
- constitutional provision for protection, 2.
- constitution requires legislation for protection of, 167, 168.
- contributory negligence not a defense to an action for injuries, 139, 181, 182, 468.
 - of, 181, 317.
 - violation of statute, 177, 179.
- copper needles for tamping required, 151, 222, 235.
 - tipped tamping bars to be used, 201, 222, 235.
 - tips on iron tamping bars, 151.
- crime to change checks to defraud, 227.
 - place wrong number or sign on car, 227.
- damages recoverable for injuries, 184.
- dangerous conditions at face of coal, marking not required, 298, 299.
 - making safe, no recovery for injury, 298.
- death of, who may sue, 139.
- defacing or destroying danger signals or notices, unlawful, 226.
- demand for props necessary, 175, 176.
 - pursuant to custom or rule, 275, 276, 277.
- dimensions of props to be specified by, 271.
- disobedience of orders, liability, 132, 201, 226.
 - made unlawful, 132, 201, 226.
- disturbing hoisting equipment, unlawful, 226.
- duties as to looking at record of examination at mine, 181.
 - imposed on, 297, 298, 299.
 - relating to mining machinery and property, 132, 201, 226.
 - of mine manager as to employment, 92.
 - to desist work after demanding props, 181.
 - make demand for props of sufficient dimension, 175, 176.

MINERS—Continued.

- duties to prop and secure his working place, 176, 194, 226.
 - set props, marking required where prop is knocked down, 238.
- employees included as, 251.
- employment in coal mines prohibited without certificates, 92, 94, 96, 98.
 - proof of experience, 92.
 - of certificated miners, 92, 94, 99.
 - uncertificated miner prohibited, 93, 96, 98.
 - with experienced miner permitted, 92, 94, 97, 99.
 - without certificate prohibited, 103.
- empty cage to be furnished at end of shift, 200.
- entering mine without check prohibited, 226.
- entrance checks to miners withheld in case of danger, 223, 236.
- examination for certificates, 92, 93, 94, 95, 97, 99.
 - of working places required as to use of props, 176, 226.
- exercise of care after demanding props, 181.
 - in the face of peril, 181.
 - required, 180, 181.
 - willful violation of statute, recovery, 191.
- fee for certificate, 93, 95, 98.
- fellow servants, hoisting engineer and miners not, 252.
 - instances, 282.
 - who are, 260.
- girls not to be employed in coal mines, 129, 132, 133, 134, 143, 146.
 - health or lives endangered, caution against, 132, 146, 204, 226.
- holder of certificate from county board, 99.
 - may seek employment as coal miner, 102.
 - not a shot firer, 101.
- injuries provisions of compensation acts, 394, 403, 418, 440-452, 461-463.
- injuring appliances or machinery unlawful, 226.
 - mining machinery or property, liability, 132, 201, 226.
 - property unlawful, 201, 226.
- injury at landing, recovery, 267.
 - by willful violation of statute, exercise of care, recovery, 181.
 - to nonresident alien, recovery of damages, 136.
- insufficient ventilation, remedy, 156, 161, 445.
- intoxicated, not to enter mine, 226.
- iron tamping bars prohibited, 151.
- judges of working places as to necessity for props, 176.
- judicial notice as to support for overlying stratum, 176.
- knowledge of danger, assumption of risk, 183.
 - not contributory negligence, 139.
- leaving mine without giving up check, 226.
- legislation for protection of required, 167, 168.
 - safety, 2.
- liability for injuring mining machinery or property, 132, 201, 226.
- lights on landings to be furnished, 200, 215, 230.
- making dangerous place safe, 170.
- meaning of term "miners," 251.
- meetings of miners examining board for examination of, 93, 96, 97, 106.
- mine manager's presence required when entering and leaving mine, 226, 237.
 - owner may employ uncertificated, 101.
- minors under 14 years of age not to be employed in mines, 129, 143.
 - 12 years of age not to be employed in mines, 132, 133, 134, 143.
- notice of ordinary dangers not required, 183.
- not required to look for records showing dangerous conditions in mines, 172.
- obedience to rules adopted by operator, 297, 298.
- obstructing stairways prohibited, 201, 226.
- opening locked safety lamps without permission, unlawful, 226.
- penalty for employment of uncertificated miner, 94, 96, 98.
 - using iron tamping bars, 151.
- persons entitled to benefit of statute, 303.
 - protection of statute, 137.
- places of meetings of board for examination of, 93, 96, 97, 100.
- pleading in actions for damages for injuries, 319-327.
- proof in actions for damages for injuries, 319-327.
 - of experience to obtain certificate, 92, 93, 95, 97.
 - practical experience for employment, 92.

MINERS—Continued.

- propping working places, statutory duties, 226, 271-277.
- protected by statutory enactment, 170.
- protection afforded by performance of statutory duties, 180.
- purpose of act requiring examination of miners, 102.
- rate of speed of cage in lowering and hoisting, 200.
- recovery of damages for operator's failure to deliver props, 175, 176.
 - for injuries notwithstanding contributory negligence, 182, 449-453, 461-463.
 - pleading and proof, 319-327.
 - operator's violation of statute, 177-180.
- responsible for safety lamps, 201.
- riding on loaded cars prohibited, 226.
 - uncovered cage, recovery for injuries, 130.
- risks assumed by, 336.
 - not assumed by, 337.
- rules governing to be posted at mine entrance, 226.
- safe place, application of doctrine, 170.
- scope of employment, proof sufficient for recovery, 303.
 - what constitutes, 303.
- statutes enacted for health and safety of, 169
 - for protection, 170.
 - protecting pursuant to constitution, 2.
- statutory duty as to use of props, 176.
 - provisions, disobedience by, 297.
 - not waived by contract, 183.
- tamping bars tipped with copper required, 151
- uncertificated may be employed, 101.
- unlawful acts specified, 226.
 - to enter mine while intoxicated, 226.
 - injure mining property, 132, 201, 226.
 - use iron tamping bars without copper tips, 151.
- violation of rule in conflict with statute, 297, 298.
 - statute by operator, effect of contributory negligence, 331, 332, 333, 334, 335.
 - effect on contributory negligence, 177, 179, 180.
- weight of coal as basis of wages, 386, 387.
- who are, 251.
- women not to be employed in coal mines, 129, 132, 133, 134, 143, 148.
- working place, dangerous conditions to be marked by mine examiner, 225, 236.
 - duty to examine and prop, 176, 226.
 - injury from coal from face of coal, no recovery, 206.
 - miner required to prop, 194, 226.
 - sounding and making safe, 226.
 - with experienced coal miner, 92.
 - without sufficient ventilation, remedy, 156, 161, 447.
- workmen's compensation acts, 394, 403, 418, 447, 459.

MINERS' EXAMINING BOARD.

- See also Certificates, Coal-mine operator, County inspector, Hoisting engineer, Inspection districts, Mine examiners, Mine inspectors, Mine managers, Mining operations, Mining statutes, State mining board.
- abolished, 438.
- act of 1909 constitutional, 101.
- adoption of rules for examinations, 66, 71, 78.
- affidavit as to right of examination, 65, 72.
- annotations, as to, 67, 100-103.
- annual coal report, 71.
 - session, 78.
- applicants entitled to certificates, 64, 72, 80.
 - examination as to knowledge of mining, 63, 78.
 - for certificates for hoisting engineers, 69, 73, 79, 85.
 - mine examiners, 63, 69, 72, 79, 85.
 - qualifications and proof, 63, 72.
 - mine inspectors, knowledge of mining operations, 63, 72, 78.
 - proof required, 63, 68, 72, 78, 79, 84.
 - managers, 63, 68, 72, 79, 84.
 - second-class mine manager, 72, 79, 84.
 - must prove residence and citizenship, 63, 68, 78.
 - register with board, 65, 72.

MINERS' EXAMINING BOARD—Continued.

- appointment of, 65, 70, 77.
 - chief clerk, 71, 77.
 - members, 62, 63, 66, 67, 70, 71, 77, 437.
 - of county board for examination of miners, 92, 94.
 - State board, for examination of miners, 97, 100.
 - mine inspectors, 63, 66, 68, 74, 79, 84.
 - one inspector for each inspection district, 63, 68, 74, 81, 87.
 - State mining board, 67, 70, 77.
- appropriations for, 90, 91, 103.
 - expenses and salaries, 50, 51.
- authority of judges to appoint, validity of act, 101.
 - to grant certificates to mine managers, 54, 56.
- biennial sessions, 66, 71.
- blanks, books, and stationery furnished by secretary of state, 62, 66, 67, 71.
- cancellation of certificates, 65, 74, 81.
- certificate fee, 65.
 - issued by, 64, 73, 80.
 - under signature and seal of board, 60, 80.
 - of competency as, hoisting engineers, 69, 73, 79, 85.
 - mine examiner, 63, 69, 72, 79.
 - inspectors, 63, 68, 72, 79, 84.
 - managers, 63, 68, 72, 79, 84.
 - second-class mine manager, 72, 79, 84.
 - employment of holder, as miner, 67, 80.
 - good character, 65, 72, 79.
 - to applicants above minimum rating, 69, 80.
 - certificated persons in other States, 64.
- certified mine inspector without examination, 63, 74, 75, 81, 87.
- changed to miners' examining officers, 438.
- chief clerk may be appointed, 71.
- coal miners' member to be elected secretary, 71, 77.
 - operator member elected president, 71, 77.
- collection of statistical details as to coal mining, 71, 77.
- commissioners of labor may call special meeting, 66.
- compensation of board for examination of miners, 93, 95, 97, 100.
 - members, 54, 65, 71, 78.
- competent persons certified to governor, 66, 79.
- composition of board, 67, 77.
- conditions for cancellation of certificate, 65, 74, 81.
- constitutionality of amendatory act of 1909, 101.
- contents of certificates issued by, 55, 56, 64, 69, 73, 80.
 - record of certificates, 61, 69, 73, 80.
- control of mine inspectors, 71, 77.
- county board for examination of miners, 92, 94.
- creation, 437.
- credentials, fee for examination, 65, 72.
 - required of applicant, 65, 72, 78.
- date and term of appointment, 67, 71, 77.
- determination of fitness of hoisting engineers, 65, 66, 73, 79, 85.
 - mine examiners, 63, 64, 72, 73, 79, 85.
 - mine inspectors, 63, 65, 72, 77, 84.
 - mine managers, 63, 68, 72, 79, 84.
 - second-class mine managers, 72, 79, 84.
- payment of salary of secretary, 65, 71, 78.
- discretion in issuing certificates, 64.
- duties administered by miners' examining board, 439.
 - of board, 65, 67, 70, 71, 77, 78.
 - for examination of miners, 93, 95, 97, 100.
 - relating to survey of coal mines, 50.
- duty to grant certificate in case of competency, 54, 56.
 - keep record, 93, 96, 98, 100, 103.
 - pass on competency of applicants for hoisting engineers, 62, 70, 73, 77, 79, 85.
 - mine examiners, 63, 70, 72, 77, 79, 85.
 - inspectors, 62, 63, 70, 72, 77, 84.
 - managers, 62, 70, 72, 77, 79, 84.
 - second-class mine managers, 72, 79, 84.

MINERS' EXAMINING BOARD—Continued.

- effect of certificate, 64, 69, 73, 80.
- employees of board, 71, 77.
- employment of certificate holders, 64, 69, 80.
 - uncertificated persons in emergency, 64, 69, 80.
- evidence as to character and habits of applicants, 64, 69, 79.
- examination at special meeting, 62, 68, 71, 78.
 - conducted under rules and regulations adopted, 62, 66, 68, 71, 78.
 - for appointment, 66, 78.
 - of applicants, 66, 68, 71, 78.
 - for fire bosses and hoisting engineers, 56.
 - hoisting engineers, 69, 73, 79, 85.
 - miners, 92-99.
 - mine examiners, 63, 69, 72, 73, 79, 85.
 - inspectors, 63, 66, 68, 70, 72, 78, 79, 84.
 - managers, 54, 56, 63, 68, 72, 79, 84.
 - persons holding foreign certificates, 69.
 - second-class mine managers, 72, 79, 84.
- exchange of certificate authorized by, 64, 65.
- fees covered into State treasury, 65, 78.
- frequency of meetings, 62, 68, 71, 78.
- governor to appoint inspectors of mines for each district, 63, 66, 68, 81.
- holding special meetings, 62, 68, 71, 78.
- inspectors appointed, 63, 66, 68, 77.
 - from names certified to governor, 63, 68, 74, 79, 84.
- may exchange certificate of fire boss, 64.
- meetings held annually, 78.
 - in different parts of State, 66, 71, 78.
 - of board, 54, 62, 66, 68, 71, 78.
 - for examinations of miners, 93, 95, 97, 100.
- members and qualifications, 62, 65, 68, 70, 77.
 - appointed by governor, 67, 70, 77.
 - sworn to faithful performance of duty, 67, 77.
- mine examiners' certificate given to fire boss, 65.
 - inspectors appointed from those certified by board, 63, 66, 68, 72, 81.
 - appointment by governor, 63, 66, 68, 72, 81.
 - qualifications for appointment, 63, 66, 68, 72, 79.
 - managers of second-class, 72, 79, 84.
- names certified to governor, 63, 68, 72, 79, 84.
 - of applicants certified to governor, 63, 66, 68, 72, 79.
- notice of charges before cancellation of certificate, 65, 70, 74, 81.
 - meetings for examinations, 62, 66, 68, 71, 78.
- offices of board, 66, 71, 77.
 - provided in capitol, 66, 71, 78.
- officers acting throughout the State, 101.
- only certificated mine managers to be employed, 64, 80.
- opportunity for hearing before cancellation of certificate, 65, 74, 81.
- organization of board, 66, 71, 77.
- payment of compensation, 65, 72, 78.
- personnel of board, 66, 67, 70, 77.
- places and times of meeting, 62, 66, 68, 71, 78.
 - of meeting, 54.
 - for examination of miners, 93, 95, 97, 100.
- powers and duties, 70, 71, 77, 78.
 - of boards for examination of miners, 94, 96, 99.
 - to adjudicate upon competency of engineers, 264.
- publication of rules, 62, 66, 68, 71, 78.
 - statistical details, 71, 77, 83.
- purpose, 62, 65, 67, 70, 77.
- qualifications and residences of members, 102.
 - for hoisting engineers, 69, 73, 79, 84.
 - mine examiners, 63, 69, 72, 73, 79, 84.
 - of applicants for mine inspectors, 63, 68, 72, 78, 79, 84.
 - managers, 63, 68, 72, 79, 84.
 - of second class, 72, 79, 84.
 - members for examination of miners, 62, 66, 68, 71, 78.
 - of board, 67, 70, 71, 77.

MINERS' EXAMINING BOARD—Continued.

- rating for mine inspectors, 63, 68, 72, 79, 84.
 - applicants examined, 64, 73, 80.
- record of certificates, 55, 56, 69, 80.
 - names of persons receiving certificates, 64, 73, 80.
 - proceedings required, 93, 96, 99, 100, 103.
 - rules, 66, 68, 71, 78.
- register of certified persons required, 64, 73, 80.
- regular sessions of, 66, 68, 71, 78.
- report of examination for certificates, 54.
 - to commissioner of labor of applicants examined, 64.
- rights of certificate holders, 64, 69, 73, 80.
- room for meeting in State House, 62, 66, 68, 71, 78.
- rules as part of record, 62, 66, 68, 71, 78.
 - for control of employees, 71.
 - mine inspectors, 71.
 - of procedure, 62, 66, 68, 71, 78.
 - to be of uniform application, 66, 71, 78.
- salaries, 51.
- salary of chief clerk, 71, 78.
 - secretary, 65.
- secretary of board, 66, 71, 77.
 - not a member of, 67.
 - of state to furnish supplies and office, 62, 66, 67, 71, 78.
 - to be a coal miner member, 71, 77.
- selection of officers, 67, 71, 77.
- special meetings, 62, 66, 68, 71, 78.
 - called by commissioners of labor, 66.
 - for examination, 71, 78.
- State board for examination of miners, 97, 100.
- supplies furnished by secretary of state, 62, 66, 67, 71, 78.
- term of office of members, 62, 66, 71, 77.
- time for meeting, 54.
- times of meetings for examination of miners, 93, 96, 97, 100.

MINERS' EXAMINING OFFICERS.

See Department of Mines.

MINERS' INSTITUTES.

- See also University of Illinois.
- act repealed, 440.
- engineering department created, 10.
- administration vested in trustees of University of Illinois, 104.
- appropriations for, 104.
- establishment and maintenance, 104.
- Illinois Miners' and Mechanics' Institute, 104.
- miners and mechanics' institutes, 104.
- purpose to promote technical efficiency about mines, 104.

MINERS' LIENS.

- See Miners, Miners' wages.
- act to protect miners working in coal mine, 105.
- annotations, 105.
- application of statute to mining operations, 105.
- character of work giving lien, 105.
- enforced as a mechanics' lien, 105.
- extent of, 105.
- laborers and miners' liens, 105.
- lien for value of labor, 105.
 - not extended to land outside of coal mine, 105.
 - of miners at coal mines, 105.
 - employed by receiver, 105.
 - on fixtures and property used in mines, 105.
 - restricted to opening and developing mine, 105.
- miner digging coal, extent of lien, 105.
 - employed by receiver entitled to, 105.

MINERS' WAGES.

- See also Miners, Miners' Liens.
- act does not include farming, 108.
- for payment in money applies to prices agreed upon, 109, 110.
- requiring coal-mine operators to pay miners semimonthly, 110.
- weekly payment unconstitutional, 108.

MINERS' WAGES—Continued.

- to prohibit trucking system, 106.
- provide for payment in lawful money, 106.
 - of coal miners in money, 106.
 - weekly payment by corporation, 107.
- agreements to accept difference wages prohibited, 108.
- upon price on run of mine basis, 109.
- annotations, 106, 108, 109.
- application of act to trucking system, 107.
- assignment of future wages prohibited, 108.
- coal mined and loaded to be paid for in money, 109.
- miners to be paid in lawful money, 109.
- constitutionality of act for payment in money, 107.
 - requiring weekly payment, 108.
- construction of act requiring weekly payment, 108.
- contracts in violation of act void, 106.
- deductions from, 106.
 - wages except for money, 106.
 - made may be recovered, 106.
- due semimonthly, action to recover, 110.
- duty of mine inspector to enforce act for payment for coal mined, 109.
- effect of act for payment for coal mined on contract of parties, 110.
 - on price for different grades of coal, 110.
 - contracts of act for payment in money, 109.
- mine inspector to enforce act for payment in money, 109.
 - operators shall not contract for payments different from statute, 110.
- miners prohibited from contracting with employer, 107.
- mining companies required to pay miners weekly, 107.
- payment in lawful money required for all grades of coal, 109.
 - money, 109.
 - of, 106.
- penalty for contracting in violation of act, 106.
 - violating act requiring semimonthly payment, 110.
 - weekly payment, 108.
 - for payment in money, 106.
 - requiring payment for coal mined, 109.
- prohibition of act includes mining, 107.
 - operates upon mining as a business, 107.
- purpose of act requiring payment in money, 106.
- recovery of penalties for violation of act requiring weekly payment, 108.
- sections 1 and 2 of act for payment in money unconstitutional, 107.
- semimonthly payment, 110.
- truck system prohibited, 106.
- unconstitutionality of act requiring weekly payment, 108.
- unlawful for mine operator to keep truck stores, 108.
 - to make deduction from wages except for money, 108.
- validity of act requiring payment in money, 109.
 - weekly payment, 108.
- violation of act for payment in money, 106.
 - requiring semimonthly payment, 110.
 - weekly payments, 108.
 - for payment of coal miners in money, 109.
- weekly payment required, 107.

MINERS' WASHROOMS,

- See also Mine Inspector, Mining operations, Miners.
- act of 1903 requiring mine operators to provide, unconstitutional, 111.
 - 1913 requiring mine operators to provide, is valid, 111, 112.
 - requiring coal mine operators to provide, 111.
 - not special legislation, 112.
- annotations, 111, 112.
- application of act to employers of labor, 112.
- arrangement and furnishings, 112.
- constitutionality of act of 1913 requiring mine operators to provide, 111, 112.
- construction of act requiring miners' washrooms, 112, 113.
- conviction for daily offense for failing to provide, 112.
- duty of mine inspectors to inspect and report, 112.
- hot and cold water required, 112.
- inspection by mine inspector, 112.

MINERS' WASHROOMS—Continued.

- location with reference to mine, 112.
- mine operators to provide, 111.
- penalty for violation of act requiring, 112.
 - coal operators to provide, 111.
- purpose of act requiring, 113.
- unconstitutionality of act of 1903, 111.
- violation of act requiring mine operators to provide, 111, 112.

MINING BOARD,

- See also Board of mine examiners, Department of mines and minerals, Director, Miners' examining board.
- adoption of rules for examinations, 439.
- cancellation of certificates, 439.
- certified copies of examination to be furnished, 439.
- control of State mine inspection service, 439.
- creation, 437.
- director as executive officer, 439.
- examination of applicants for hoisting engineers, 439.
 - mine examiners, 439.
 - inspectors, 439, 440.
 - managers, 439.
- examinations, notice of meeting, 439.
- meetings, 439.
- notice of time and place for examinations, 439.
- power to remove inspectors, 439.
- preservation of written examinations, 439.
- report to director, 439.

MINING CORPORATIONS.

- See also Burying dead miners, Coal-mine operator, Drainage of mines, Eminent domain, Inspection and examination of mines, Miners, Miners' wages, Miners' washrooms, Mining operations, Mining statutes.
- act authorizing formation of, 114, 115, 118, 119.
 - ownership of stock in railroad companies, 123.
- of 1891 preventing combines not repealed by act of 1893 or of 1897, 122.
- 1897 preventing combines unconstitutional, 123.
- prohibiting trucking system by, 106.
- requiring listing and assessment of property for taxation, 381, 384.
 - miners' washrooms, 111.
- to provide for payment of coal miners in money, 109.
 - weekly payment of miners' wages by, 107.
 - require payment of miners' wages semimonthly, 110.
- agreements as to combine, 121.
 - fixing price of commodities, 121.
- amendatory act authorizing ownership of stock in railroad companies, 123.
- annotations, 119, 121, 122, 123.
- appropriation of land for drainage of mine, 5.
 - right of way for tramway, 119.
- assessment of capital by State board of equalization, 384.
- authorized to own stock in railroad companies, 123.
- books and records of, 117.
 - subject to inspection, 118.
- burial expenses of dead miners, 1.
- burying bodies of dead miners, 1.
- capital stock of, exempted from taxation, 384.
 - payment, 114, 115.
- charge of conspiracy, sufficiency, 122.
- classification of, 122.
- combines by, prohibited, 120.
 - pools, and trusts, mining corporations prohibited from forming, 120.
- conspiracy to defraud, 121.
- construction of statute preventing combine, 122.
- contents of certificate of incorporation, 114, 119.
 - schedule, 381, 382, 383.
- crimes relating to permissible explosives, 18.
- deductions from wages of miners prohibited, 106.
- deposit of mine refuse, 5.
- diminishing capital stock, 114.
- directors, selection and authority, 114, 115, 116.

MINING CORPORATIONS—Continued.

- drainage of mine, 5.
- duty as to gates at top of shaft, 138.
- to make provisions for safety of miners, 167.
 - provides washroom, 111.
 - release forfeited mining lease, 126.
- eminent domain, proceedings, 5.
- exercise of eminent domain by, 119.
- failure for two years to comply with statute liability, 138.
- fee for inspection, payment condition for operating coal mine, 164, 166.
- formation of, 114, 115, 118, 119.
- incorporation proceeding, 114, 115, 119.
- increase of capital stock, 114.
- injunction to prevent mine operation unless requirements complied with, 164, 166.
- inspection fees, payment of, condition for operating coal mine, 164, 166.
 - of books and records, 118.
- legislative power to classify, 122.
- liability for failure to release forfeited lease, 126, 127.
 - of stockholders, 114.
- limitation on transfer of stock, 117.
- listing property for taxation, 381, 382, 383, contents of schedule, 381.
- manufacture, use, and sale of explosives, regulation, 11-17.
- mine refuse, place of deposit, 5.
- mining operations enjoined unless requirements complied with, 164, 166.
- officers for management of, 114, 115, 119.
- operation of mine enjoined unless requirement complied with, 164, 166.
 - unlawful without compliance with conditions, 164, 166.
- operator may be a corporation, 202, 229.
- organization of, 114, 115, 119.
- ownership of stock in railroad companies limited, 123.
- owning stock in railroad companies, 123.
- payment for coal mined in money, 103.
 - of capital stock, 114.
 - miners' wages semimonthly, 110.
- penalty for operating mine without compliance with requirements, 164, 166.
 - violation of act providing for payment of miners wages, 106, 108, 109, 110.
- pools by, prohibited, 120.
- powers of, 115, 117, 118, 119.
 - directors, 118.
 - eminent domain, 119.
- procedure where mine is operated without compliance with requirements, 164, 166.
- provisions for safety of miners required, 167.
- punishment for entering into combines, 121.
- right of eminent domain, 5.
- semimonthly payment of miners' wages required, 110.
- stock as personal property, 116.
- transfer of stock, 116.
- truck system by prohibited, 106.
- trusts by, prohibited, 120.
- unlawful combinations by, 121.
 - to operate mine without compliance with laws, 164, 166.
- validity of acts prohibiting combines, 122.
 - amendatory act of 1897, preventing combines, 123.
- violation of statute providing for payment of miners' wages, 106, 108, 109, 110.
 - liability for injuries, 138.
- weekly payment of miners' wages required, 107.

MINING ENGINEERING.

- See also Miners' institutes, University of Illinois.
- appropriations for at university, 10.
- course of instruction at university, 10.
- department of in university, 10.

object and duty, 10.

MINING INVESTIGATION COMMISSION.

- act establishing mining investigating commission, 124, 443.
- adoption of rules for government, 444.
- appointment of clerk and stenographer, 444.
 - members, 124, 443.

MINING INVESTIGATION COMMISSION—Continued.

- appropriations for, 125, 445.
 - expenses, 443, 445.
- attendance of witnesses compelled, 124, 443.
- authority of each member, 124, 443.
 - commission, 124, 444.
 - to take testimony, 124, 444.
- called meetings, 125, 444.
- commission to investigate mines authorized, 124, 443.
- compensation of members, 125, 445.
- conditions of coal mining to be investigated, 124, 444.
- creation, 443.
- duties and powers generally, 443, 444.
 - to report to governor and general assembly, 125, 444.
- employees, 444.
- employment of clerk or stenographer, 125, 445.
- fees of witnesses, 124, 444.
- investigation of methods of mining coal, 124, 443.
- meetings at request of three members, 125, 444.
 - election of officers, 444.
 - of, 124, 444.
- members, 443.
- methods of coal mining to be investigated, 443.
- notice of meetings, of, 124, 444.
- organization and selection of officers, 124, 443.
- payment of expenses, 125, 445.
- place of called meeting, 444.
- powers in connection with investigation, 124, 444.
 - to take testimony, 444.
- printing provided for by State board of contracts, 125, 444.
- proposed revision of coal mining laws by, 125
- qualification of members, 124, 443.
- quorum of, 125, 444.
- recommendations as to coal mining, 444.
- record of proceedings, 125.
- report of testimony taken by, 125, 444.
 - to general assembly, 444.
- governor, 444.
- rules for government, 124.
- salaries of members, 445.
- termination of duties and functions, 125.
- testimony taken by to be reported, 125, 444.
- times and places of meetings, 125, 444.
- witnesses compelled to attend, 444.

MINING LEASES—RELEASE.

- action against lessee to compel release of record, 126.
- act to compel lessee, assign or heir to release, 126.
 - release of gas or oil leases, 126.
- duty of lessee to release, 126.
- failure of lessee to release, 126.
- forfeited gas and oil leases to be released, 126.
 - must be released, 137.
- liability of lessee for failure to release, 126.
- release by assigns, 126.
 - heirs, 126.
 - representatives, 126.
 - of, 126.
 - oil leases, 126.
 - on forfeiture, 127.

MINING MACHINERY.

See Miners.

duties of miners in relation to, 132.

MINING OPERATIONS.

See also Actions, Assumption of risk, Bore holes, Coal cars, Coal mines, Coal-mine operator, Contributory negligence, Drainage of mines, Explosives, Fire boss, Gangways, Gates, Girts, Headingways, Hoisting and hoisting equipment, Hoisting engineer, Inspection and examination of mines, Maps, Mine accidents, Mine examiner, Mine foreman, Mine inspector, Mine managers, Miners, Negligence, Nuisance, Powder, Props, Refuge places, Roads and roadways, Rules, Safety lamps, Shafts, Shot firers, Signals, Stables, Ventilation, Women, Workmen's compensation act.

abandoned workings, duty of operator on approaching, 227.

MINING OPERATORS—Continued.

- accidents, duty of inspector, 199, 227.
 - operator, 199, 227
 - to give notice of, to mine inspector, 130, 135, 136, 143, 227
- action for damages for violation of statute, negligence immaterial, 217.
 - to recover penalty for failure to provide fire protection, 151.
- act of 1872 repealed, 140.
 - relating to shot firers, 376, 377, 378.
- admissibility of expert evidence relating to, 338, 339.
- adoption and posting of rules required, 236.
- agent, as used in act is person in control of mine, 129, 134.
 - personally liable for violation of statute, 178.
- age of children employed in, 129, 132, 133, 134, 143, 145, 228.
- air to circulate at all working places, 129, 142, 150, 152, 156, 164, 219, 233.
- amendatory act, 445.
- amendments of maps required, 128, 141, 147, 159, 188, 208, 212.
- annotations, 138-140, 167-186.
- appliances on self-acting engine plane, 139, 143, 158.
- application and protection of statute, 137.
 - of statute to fencing shafts, 173.
- approaching old workings, 199, 227.
- assumption of risk unavailing in actions for violation of statute, 317, 402.
- authority of inspector over ventilation, 197, 207, 219, 226, 233, 445.
- automatic doors required, 196, 206, 220, 223.
- bandages, supply to be kept by operator, 261, 228.
- black powder, use in coal mines, 16.
- blankets, number to be kept by operator, 261, 227.
 - supply to be kept by operator, 261, 227.
- blasting coal, regulations for use of explosives, 15-18, 221, 224.
 - requirements as to use of explosives, 222, 235.
 - prohibited until miners are out, 376, 377.
 - powder, storage and use, in, 197, 210.
- boiler, care and inspection required, 143, 158, 162, 217, 223, 231, 263.
 - houses, distance from mouth of shaft, 151, 218, 232.
 - covered with fireproof material, 151, 218, 232.
- bore holes in advance on approaching old workings, 199, 227.
 - penalty for violating act, 129, 132, 133, 134, 142.
 - required under certain conditions, 129, 142, 227.
 - to be kept in advance of working places, 129, 142, 227.
- boss driver acting as motorman, liability of operator, 269.
- boundaries, 10-foot limit, 199, 227.
- boundary lines of mine shown by map, 126, 141, 146, 159, 188, 208, 212.
- boys, condition for employment in, 196, 206, 226.
 - under 14 not to be employed in, 198.
 - 16 not to be employed, 206, 228.
- buildings covered with fireproof material, 151, 218, 232.
- cages, penalty for violating act, 129, 132, 133, 134, 144, 157.
 - required with coverings, 129, 132, 133, 134, 142, 147, 157, 214.
 - to be furnished with springs or catches, 134, 143, 146, 167.
 - used without cover, liability, 138, 144, 147, 158.
- cap pieces and props to be supplied by operator, 146, 158.
- care of boilers and engines by engineer, 195, 217, 225, 231, 243.
 - required of miner, 180, 181, 201.
 - after demanding props, 181.
 - operator, 170.
 - steam boilers, 130, 143, 158, 162, 217, 231, 243.
- certificate of inspection to mine inspector, required, 130.
- checking system for miners on entering and leaving mine, 223, 226.
- coal cars to be equipped with signals, 130, 143, 147, 158, 162, 216, 221, 226.
 - hoisting prohibited while miners are going in and out, 130, 143, 158.
- mine and mine include all parts of mining plant, 256.
- mine operator enjoined from violation of law, 131, 132, 145.
 - must adopt signals, 157, 216, 230, 242.
 - required to make and file map, 128, 141, 146, 153, 188, 207, 212.
 - to keep supply of props, 146, 158.
 - provide appliances for inspection, 145.
 - safe cages, 129, 132, 133, 134, 142, 147, 157.
 - signals between top and bottom, 129, 132, 133, 134, 142, 147, 157, 216, 230, 242.
 - sufficient ventilation, 156, 161, 219, 233.

MINING OPERATIONS—Continued.

- code of signals required, 157, 216, 230, 242.
 - to be posted at top and bottom of shaft, 158, 216, 231, 242.
 - used, 198, 204, 216, 230, 242.
- communication with contiguous mines at every stratum, 128, 141, 147, 155, 160, 241.
- competency of engineer, question of fact, 175.
- competent hoisting engineers required, 130, 158.
- conscious failure of operator to comply with statute as willful violation, 177-180, 306.
- construction and location of furnaces for ventilation, 129, 142, 150, 167, 161.
- contracts relating to, permitted, 3.
- contributory negligence, not a defense, 139, 462.
 - of miner, effect, 298.
 - knowledge of danger, 139.
- copper-tipped tamping bars to be used by miners, 201, 222, 235.
- coroner must hold inquest on death of miner, 199.
- corrections shown on maps, 128, 141, 147, 159.
- costs of investigation of mine accidents, 130, 135.
- cross-cuts required, purposes of statute, 311, 446.
 - for ventilation, 281, 446.
- daily inspection of mines required, 156, 161, 225, 238.
 - with safety lamp, required, 170, 171, 225, 238.
- damages for mining under surface, 186.
- danger at face of coal assumed by miner, 336.
 - incident to working place, assumed by miner, 336.
 - notices to be posted by mine examiner, 196, 205.
 - signals to be displayed, 194, 221.
- dangerous conditions, absence of mark, assumption by miner, 299, 333.
 - physical facts indicating, effect on liability, 288.
- abstracts of decisions relating to, 282-297.
- accumulations of coal on car track, 292.
- act of 1911 does not require marking at face of coal, 297.
- "all conditions," meaning, 284.
- amendments of act of 1907, 296, 297.
- application and construction of act of 1911, 296, 297.
 - of statute to machinery above ground, 286.
 - statute to physical conditions, 286.
- arising in progress of work, 292, 293.
 - marking not required, 290.
- block of coal not, 293.
- change of statute as to places above ground, 286.
- changes in act of 1911, 296.
- checks withheld from miners until conditions are safe, 291.
- construction of statute as to miners entering mine, 296.
- date of examination required, 282.
- determination and good faith of mine operator, 287, 288.
- "display danger signals," effect and meaning, 292.
- electrical appliances, 286, 287.
 - excessive voltage, 286, 287.
- entry in "fair" condition, effect, 286.
- failure to mark, abstracts of decisions relating to, 290, 291, 292.
 - as proximate cause of injury, 312.
 - instances, 290.
 - liability of operator, 290.
 - take miner's check, violation of statute, 291.
- include engines and appliances on the surface, 255.
- knowledge of operator, willful violation of statute, 315.
 - or want of knowledge of, 288.
- Liability of operator for failure to mark, 284, 290, 291, 292.
 - permitting men to enter mine, 296.
- live wire as, 286, 287.
- low roof in entry, liability of operator, 292.
 - as, marking required, 284, 285.
- marking applies to all, 283.
 - at bank of coal not required, 293.
 - face of coal not required, 307.
 - limitations of act of 1911, 297.
 - not required, 292, 293.
 - while being repaired, 290.

MINING OPERATIONS—Continued.

dangerous conditions, marking required where prop was blown out, 298, 299.
what constitutes, 289, 290.

obliterated, effect on liability, 289.

meaning and application of statute, 255.

mine examiner's examinations limited to underground workings, 286.

failure to mark, 291.

good faith, effect on liability of operator, 288.

lack of opportunity to mark, 290.

must mark and report, 287.

report to mine manager, 292.

to mark as notice to miner to keep out, 292.

manager not personally to mark, 291.

to be personally present in repairing, 294.

manager's duty as to marking, 291.

miner engaged in making safe, recovery for injury, instances, 300, 301, 302.

making safe assumes risk, 336.

permitted to enter mine, construction of statute, 285.

repairing, no recovery for injury, 298.

enlarging entry marking excused, 290.

entering mine, violation of statute, 294.

not permitted to enter mine, 294.

working place, 298, 299.

marking excused, 290.

under mine manager, marking required, 285.

meaning, 294.

neglect to discover, willful violation of statute, 308.

nonexistent at time of examination, 300.

before miner entered working place, 290.

not specifically prescribed, duty and liability of operator, 263.

object of statute in requiring marking, 294.

operator, duty as to marking, 291.

failure to mark, liability, 287, 288.

liability for miner's injury while making safe, 301, 302.

not to be personally present in repairing, 294.

or places, statutory provisions relating to, 282-297

places above ground included in statute, 286.

powder smoke at working place, marking not required, 298.

probable and present conditions included, 288.

condition, clod in roof, 292.

proof, 255.

of explosions, 225.

purpose of act to protect miners, 285.

question of fact, 283.

record of, what constitutes, 293, 294.

without marking, liability of operator, 294.

required to be marked, 170, 225, 239.

roof of working place dangerous, 292.

statute does not apply to face of coal, 298, 299.

statutory provision as to men entering mine, construction and meaning, 294, 295, 296.

sufficiency of marking, 280.

timberman making safe, liability of operator, 302.

to be marked, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297.

violations of duty not imposed by statute, liability, 293.

voltage in excess of statutory amount, 287.

what constitutes, 283, 284, 285.

willful violation of statute as to marking, 290.

question of fact, 292.

to be marked, 194, 225, 238.

by mine examiner, 225, 238.

death of miners, investigations required, 130, 135, 148.

deposit and record of map with inspector, 128, 141, 146, 150, 188, 208, 213.

of map with inspector, 128, 141, 146, 150, 188, 208, 213.

distinction between violation of statute and negligence, 316, 317.

doors for ventilation, statutory requirements as to, 278-281.

requirements as to 196, 206, 220, 231.

self-closing required, 196, 206, 220, 233.

MINING OPERATIONS—Continued.

- drainage of mine, 5.
- drift or slope includes inclined or horizontal ways through mines, 202.
- duty and liability as to record of mine examiner, actions, 229.
 - as to propping roof, 170.
 - imposed on miners, 207, 208.
 - operator for safety of miners, 179.
 - of miner as to props, 181.
 - use of explosives and fire, 201, 221, 224.
 - mine managers as to, 194, 224, 237.
 - operator as to constructing new shaft, 129, 142, 147, 152, 156, 160, 240.
 - to furnish facilities for inspection, 192.
 - props of sufficient dimensions, 175.
 - make map showing operations, 128, 141, 146, 159, 187, 207.
 - provide appliances for inspection, 145.
 - blankets and stretchers, 237.
 - linseed and olive oil, 228.
 - safe cages, 129, 132, 133, 134, 142, 147, 157.
 - signals, 129, 132, 133, 134, 142, 147, 157, 316, 230, 242.
 - owner to report when mine is worked out, 128, 141, 147.
 - person in charge of mine to report accidents, 148.
 - on approaching old workings, 190, 227.
 - employee entrusted with ventilating apparatus is vice principal, 261.
 - considered as miner, 251.
- employment of boys, construction and purpose of act, 318.
 - girls, and women, penalty for violation, 129, 132, 133, 134, 143, 148, 157.
 - under age, willful violation of statute, 307.
 - engineer, duty and liability of mine operator, 174.
 - miners prohibited on failure to make shaft, 129, 134, 157.
- engine houses covered with fireproof material, 151, 218, 222.
 - distance from mouth of shaft, 151, 218, 232.
- plane and signals, 130, 143, 158.
- entrance to shafts to be protected, 127, 143, 156, 160, 215, 230.
- escapement shafts required in every mine, 128, 142, 147, 156, 160, 246.
- examination and inspection of mines by mine examiners, 196, 203, 205, 225, 238.
 - working places for night shift, 222, 226.
 - of mine, record, assumption by miner, 181.
- "excavations" and "workings" signify all parts of a mine, 202.
- excessive speed of cage, presumption of engineer's knowledge of, 315.
- expert evidence admissible to show, 338.
- explosives authority of mine manager over, 194, 224, 237.
 - in coal mine, 15, 16, 221, 224, 234, 237.
 - storage and use in, 197, 210, 221, 224, 234, 237.
 - use in blasting coal, 222, 235.
 - care required, 197, 210, 222, 235.
- facilities for inspection to be furnished by operator, 192.
- failure of mine examiner to mark dangerous conditions, contributory negligence of miner, 333.
 - operator to comply with statute, 138, 144, 148, 158.
 - liability, 138, 144, 158.
 - proximate cause, 138.
 - furnish prop, contributory negligence of miner, 333.
 - make daily inspection, liability, 170, 171.
 - or correct map, 128, 141, 147, 159.
 - provide cross-cuts, proximate cause of injury, 311.
 - fire protection, penalty, 151.
 - supply props, willful violation of statutes, 175, 176.
 - ventilate as proximate cause of injury, 311.
- person in charge to give notice of mine accidents, 120, 135, 136.
- tellow servants, and vice principals, 261.
 - who are, 260.
- fire protection, 151, 218, 232.
- gangways and signals, 130, 143, 158, 162.
- girls not to be employed in mines, 129, 132, 133, 134, 143, 148, 157, 198, 206, 228.
- "giving out of machinery" within meaning of statute, 178.
- hazards and perils guarded against, 2.
- hoisting and lowering miners, regulations as to, 200.
 - coal by steam, protection of miners, 151.
 - while miners are being lowered prohibited, 200.

MINING OPERATIONS—Continued.

- hoisting engineer and miner not fellow servants, 235.
 - conditions for employment, 130, 158.
 - duties of, 195, 225.
- injunction to prohibit violation of law, 131, 132, 145.
- inspection and examination of mines, 192, 217, 225, 232, 238.
 - of boilers, 130, 143, 145, 158, 162, 217, 231.
 - mine, death of miner, failure to show changes after inspection, 315, 318.
- "inspector" signifies State inspector within the district, 202.
- knowingly omitting the doing of statutory requirements, 316.
- laws to secure safety of miners, 2.
- liability of mine operator for incompetency of engineer, 175.
 - miner for disobeying orders, 132.
 - injuring machinery, 132.
 - operator for draining water from wells, 186.
 - failure to cover cage, 251.
 - furnish props, 175.
 - mistake of inspector, 137.
 - willful failure to comply with laws, 132.
 - violation of laws, 132.
 - instances, 262, 263.
- lights at top of shaft required, 137, 157, 215, 230, 241.
 - on coal cars, 270, 271.
 - required on front of trip, 198, 210, 221.
- linseed oil, supply to be kept by operator, 201, 228.
- low haulageway, liability of operator for injuries caused by, 316.
- machinery giving out, meaning of statute, 178.
- magazine for storing explosives, 18.
- maintaining lights in shaft required, 173, 174, 215, 230, 241.
- manner of producing ventilation, 129, 112, 150, 152, 156, 161.
- map of required, 128, 141, 146, 159, 187, 207, 212.
- marking dangerous conditions required, 170, 225, 238.
 - by mine examiner required, 196, 206, 225, 238.
 - on the surface required, 255.
- mine accidents, payment of costs of investigations, 130, 135, 145, 148.
 - examiner is person charged with examination of mine, 202, 225, 238.
 - failure to mark dangerous conditions, exoneraton of operator, 208.
 - report as to dangerous conditions in mine, 172, 225, 238.
 - violation of statute, evil intent immaterial, 300.
 - includes all parts of mining plant, 202.
 - manager's duties relating to, 223, 236.
 - is person in charge of underground and outside workings, 202.
 - to instruct employees in, 194, 224, 237.
- miner entitled to protection of statute, 137.
 - knowledge of uncovered cage, affect on contributory negligence, 130.
 - making dangerous place safe, 170.
 - operator's liability for injury, 300.
 - not permitted to work in absence of shafts, 129, 134, 240.
 - enter mine until conditions are safe, 171, 225, 238.
 - prohibited from riding on loaded cage or wagon, 130, 143, 153.
 - under 14 years of age not to be employed, 132, 134, 143, 157.
 - 12 years of age not to be employed, 132, 134, 143.
 - within scope of employment, 303.
 - working place, 170.
 - dangers arising from progress of work, 300.
 - recovery for injury in, 298.
 - to be kept reasonably fit, 170.
 - what constitutes, 300.
 - under dangerous roof, contributory negligence no defense, 333, 334.
 - without sufficient ventilation, remedy, 156, 161, 219, 233, 447.
- mining engineering department at university, 10.
 - operations enjoined unless requirements complied with, 164, 166.
 - statutes, penalty for violation, 228.
 - under surface, 186.
- missed shots, requirements as to, 197, 210, 222, 235.
- mistake of inspector not willful neglect of operator, 137.
- night examiner required, 223, 236.
 - shift, regulations as to, 223, 236.

MINING OPERATIONS—Continued.

- notice of accidents and death required, 130, 135, 148.
 - danger to be posted by mine examiner, 196, 205.
 - to operator of insufficient ventilation, 156, 161.
- obedience required of miners as to use of property, 201.
- object of statutes to prevent injuries to miners, 138.
- olive oil, supply to be kept by operator, 201, 226.
- operations of mine enjoined unless requirements are complied with, 164, 166.
- "operator" is party in control of mine, 202.
 - knowingly operating mine in violation of statute 307.
 - duty to sprinkle roadway, liability for injury from dust explosion, 308.
 - failure to learn dangerous conditions, willful violation, 306.
 - violation of statute, contributory negligence of miner immateria, 331-338.
 - relating to, 201, 202, 209.
 - to give notice of accidents and deaths, 130, 135, 136, 148.
- order of court prohibiting if done without escapement shaft, 172.
- original act regulating, 128.
- owner means proprietor or lessee, 129, 134.
 - required to provide ventilation, 129, 142, 150, 152, 156, 161, 219, 237.
- penalty for violation of act of 1911, 228.
 - failure of operator to give notice of mine accidents, 130, 135, 136, 148.
 - make map, 128, 141, 148, 159, 188, 208, 213, 214.
 - provide fire protection, recovery, 151.
 - miner injuring machinery, 132.
 - operating mine without compliance with requirements, 164, 166.
 - violating hoisting provisions, 130, 144, 148, 158.
- permissible explosives, storing, 18.
 - used in, 15.
- person in charge of mine to give notice of accidents, 148.
- posting notice of rules, duty and effect, 201, 226.
- powder, use in coal mines, 15, 221, 234.
- procedure in actions to recover for failure to provide fire protection, 151.
 - to compel inspection, 192.
 - where mine is operated without compliance with requirements, 164, 166.
- prohibited by injunction on violation of law, 131, 132, 145.
 - if done without escapement shaft, 172, 240.
- proof to show operations as a mine, 251.
- props, delivery to miner required, 175.
 - failure of operator to supply willful violation of statute, 175, 176.
 - to furnish as willful violation of statute, 272.
 - to be furnished by mine manager, 194, 224, 237.
- provisions as to ventilation, 196, 206, 219, 232.
- proximate cause, contributing proximate cause, liability, 313, 314.
 - of death, proof of failure to comply with statute, 317.
- purpose of survey of mine, 185.
- questions of fact in actions for damages, instances, 339, 340.
- recognized as dangerous, 3.
- recovery of penalty for failure to provide fire protection, 151.
- refuge places required on gangways and roadways, 198, 210, 217, 231.
 - duties of operator as to, 268, 269, 270.
- regulations as to use of explosives, 15-18.
 - of, 128.
 - coal mining, 169.
- removal of material from top of shaft required, 251.
- repeal of act of 1872, 140.
- report and record of mine examiner, use of new book, 320.
 - of mine examiner as to conditions of mine, 172, 225, 233.
 - when mine is worked out, 128, 141, 147.
- requirements as to stairways in shafts, 156, 160, 172, 240.
 - in the operation of cages for hoisting and lowering miners, 200.
 - of act of 1899 and 1911, 296.
- risks assumed by miner, 336.
- rule requiring miners to keep off hauling-way during working hours, validity, 267.
- rules governing, liability of operator for failure to post, 304.
 - sufficiency to escape liability, 256.
 - to be adopted and posted by operator, 201, 226.
- safe place for mining, application of rule, 170.
 - meaning and limitation, 170.

MINING OPERATIONS—Continued.

- safety devices for cages, 134, 142, 143, 147, 157, 158.
- lamps, mine manager must care for, 200, 224, 237.
- miners responsible for condition and use, 200, 219, 226.
- operator must furnish, 200, 219.
- "shaft" means vertical opening used for escapement or ventilation or hoisting purposes, 202.
- covering and fencing, 130, 143, 156, 158, 160.
- equipped with stairways, 156, 160, 172, 240.
- fencing off and protecting, 130, 143, 156, 158, 162, 241.
- gates to protect, 130, 143, 156, 158, 162, 215, 230, 241.
- shot firers, duties and method of operating, 376, 377, 378.
- shots, requirements as to, 197, 210.
- signals between top and bottom required, 129, 133, 134, 142, 147, 157, 158, 162, 216, 220.
- penalty for violating act, 129, 132, 133, 134, 148, 158
- required, 198, 204, 216, 230, 242.
- in gangways and roadways, 198, 210.
- on coal cars, 130, 142, 147, 158, 221.
- to be known by hoisting engineer, 195, 226.
- slope or drift includes inclined or horizontal ways through mines, 202.
- speed of cages in lowering and hoisting miners, 200, 218.
- sprinkling dusty galleries required, 197, 211, 220, 234.
- roadways required, 194, 220, 234.
- statistics to be collected by inspector, 131, 149, 154.
- statutes authorizing survey of mine, 185.
- regulating coal mining within police power, 169.
- statutory duty as to props and cap pieces, 175.
- requirements as to bottom and top man, 176, 218.
- ventilation, 277, 281.
- steam pump and water for fire protection, 151.
- storage of explosives, 197, 210, 221, 234.
- storing explosives, 18.
- stretchers, number to be kept by operator, 201, 227.
- subject to exercise of police power, 248.
- sufficiency of mine examiner's report as to conditions in mine, 172.
- time to construct shaft, 139, 142, 147, 152, 156, 160.
- surface and underground included, 202.
- survey of mine, 185.
- tabulation of facts by inspector, 131.
- ten-foot limit workings, 227.
- time for construction of second shaft, 129, 133, 134, 142, 147, 152, 156, 160.
- two distinct means of egress and ingress required, 128, 133, 134, 142, 147, 152, 156, 160, 240.
- underground workings, application of statute, 139.
- unlawful to operate mine without compliance with requirements, 164, 166.
- use of uncovered cage for hoisting men, liability, 138, 142, 147, 158, 162.
- ventilation, 129, 142, 150, 152, 156, 161, 196, 206, 219, 224, 237, 445.
- dangerous conditions at working places, 255.
- of mines, duty of mine manager as to, 194, 219, 224, 233, 237, 446, 447.
- penalty for violating act, 129, 142, 144, 150, 152, 156, 158, 161.
- required, 129, 142, 150, 152, 156, 161, 196, 206, 219, 220, 232, 233, 234, 445.
- statutory requirements as to, 277-281, 445.
- vice principal, failure to obey statute, liability of operator, 308.
- violation of hoisting provisions, penalty, 130, 144, 148, 158.
- statute and negligence, distinction, 316, 317.
- as proximate cause of injury, question of fact, 340.
- prima facie evidence of negligence, 311.
- to bore holes and ventilation, 129, 132, 133, 134, 144, 148.
- shafts, 228.
- ventilation, 228.
- by failure to perform required acts, 316.
- consequences unforeseen, liability, 310.
- causal relation between act and injury, 317.
- concurring cause of injury, liability, 313, 314.
- contributory negligence unavailing as a defense, 317, 462.
- effect of miner's contributory negligence, 331, 335.
- employment of boy under age, liability of operator, 318, 319.
- failure to show proximate cause, 312, 313.
- decisions relating to, 312, 313.

MINING OPERATIONS—Continued.

- violation of statute, instances of sufficiency of proof, 314, 315.
 - miner's assumption of risk not available, 336, 337, 462.
 - entering mine with dangerous conditions, 320.
 - need not be the sole proximate cause of injury, 313, 314.
 - negligence immaterial, 315.
 - one essential cause of injury, liability, 314.
 - proof and presumption, 314, 315.
 - of similar violation, 314, 315.
 - proximate cause of injury, 309-313.
 - decisions relating to, 309-313.
 - relating to, question of fact, 339, 340.
 - sufficiency of proof, 315.
 - uncovered cage, negligence of miner, recovery, 334.
- willful failure of mine examiner to obey statute, liability of operator, 308, 309.
 - manager to obey statute liability of operator, 308, 309.
 - operator to comply with statute, question of fact, 177-180.
 - to comply with laws, liability, 132, 158, 228.
- meaning as used in statute, 305.
- violation of statute, abstracts of decisions relating to, 305-317.
 - good faith as an excuse, 307, 308.
 - failure of operator to deliver props, 175, 176.
 - instances, 305-317.
 - liability, 132, 158, 228.
 - meaning, 138.
 - operator's good faith as excuse, 307, 308.
 - proof, 179, 180.
 - what constitutes, 305, 317.
- women not to be employed in coal mines, 129, 132, 133, 134, 143, 148, 157, 196, 205, 226.
- working place, miner charged with notice of danger, 302.
- workman within meaning of statute, 137.

MINING PROPERTY.

- See also Crimes, Miners, Mining operations, Ventilation.
- disturbing a misdemeanor, 132, 146, 201.
- duties of miners in relation to, 132, 146, 201, 228.
- injury by miner prohibited, 132, 146, 201.
- miner injuring is misdemeanor, 132, 146, 201.
- willful acts relating to, punished, 132, 146, 201.

MINING RIGHTS.

- See also Minerals, Mineral lands, Taxation.
- assessment for taxation against purchaser, time of marking, 345.
 - in the name of person or corporation owning, 344.
- conveyance by deed or lease, 343.
 - of, 343.
 - surface, 344.
 - separates from land, 343.
- effect of conveyance, 343.
- estate in fee separate from estate in land, 344.
- lease of oil and gas conveys a mining right in the land, 345.
 - taxation, 345.
- more than easement and not exempt from taxation, 344.
- remedy of land owner for excessive taxation, 345.
- reservation as separation and taxation, 344, 345.
 - meaning, 344.
 - of on conveyance of surface, 344.
- sale of, for taxes, effect, 343.
 - or lease of, 343.
- separation of, from land, by conveyance, 343.
- severance from land, assessment for taxes, 344.
 - of mineral from land, 343.
- taxation, 343, 344, 345.
 - separate from land, 343.
- valuation as part of land where there is no separation, 344.
- what constitutes, 343.

MINING STATUTES.

- See also Actions, Coal-mine operator, Constitution, Inspection and examination of mines, Legislature, Mine inspectors, Mining operations, Ventilation, Workmen's compensation act.
- absence of evil intent in failure to comply with, 178-180.

MINING STATUTES—Continued.

- act consciously omitted as wilfully omitted, 178-180.
- of 1879 repealed parts of act of 1877, 186.
- 1907 to protect drivers on hauling roads, 250.
- 1911 intended as a general revision, 250.
- legally passed, 240.
- validity, 249.
- acts repealed by act of 1911, 239.
- agent's liability for violation, 178.
 - violation, operator not liable, 178.
- age of boys employed in coal mines changed, 381, 382.
- angle of stairways required in shafts, 156, 160, 172.
- annual inspections left indefinite, effect, 168.
- appliances for safety of miners may be required, 168.
- application and construction of as to props and timbers, 371-377.
 - purpose of daily inspection, 254.
 - as to examination with safety lamp, 170, 171.
 - fencing top of shaft, 172.
 - mine examiner, 262.
 - miners making dangerous place safe, 170.
- of act of 1899, to shot firers, 379.
- statute to mine where five men or more are employed, 168.
- persons who may claim benefits, 303.
- to all parts of mining plant, 250.
- coal mines, 169.
- dangerous conditions, 255.
- employees as miners, 251.
- haulageways, 174.
- mine employing more than five men, 168.
- persons employed on surface, 252.
- shafts, 172.
- underground working, 250.
- arbitrary classification of mines as basis of legislation, 168.
- attorney's fees recoverable in actions against operator for violation, 302, 309.
- authorizes single action for all damages, 184.
- bottom man required, at shafts, 176.
- can not be abrogated by contract, 183.
- care required of operator for safety of miners, 260.
- certificated mine examiner's employment was to secure competent persons, 249.
- classification of miners for legislation, 248.
 - protection, 3.
 - mines as to miners employed as basis for legislation, 168.
 - discretion of legislature, 168.
 - with reference to number of men employed, 168.
 - shot firers by act of 1905, 379.
 - required by constitution, 247.
- "coal mine" and "mine", meaning as used in statute, 260.
- coal mine operator can not contract against, 183.
 - substitute less efficient lighting method, 178.
 - charged with knowledge of, 178.
 - to make provisions for safety of miners, 167.
 - willful violation, liability, 305-317.
- survey authorized by, 185.
- mining recognized as dangerous, 169.
- compensation for injuries to willful violation, 184.
- compliance with constitutional requirement protecting miners, 8.
 - by operator, assumption by miner, 181.
- conscious failure to observe as a willful violation, 177-180.
- constitutional requirements met by, 167.
- constitutionality of, 168, 248.
 - act of 1899, 248.
- constitution requires legislation to protect miners, 2, 167.
- construction and amendment, 250.
 - enforcement of, 168.
 - nature of shot firers' act, 379, 379.
- as to application to escapement shaft, 173.
- hoisting and lowering of men, 264.

MINING STATUTES—Continued.

- construction as to meaning of willful violation, 305, 306.
 - top and bottom man remaining at post, 264.
 - of for protection of miners, 4.
 - laws for protection of miners, 3.
 - provisions requiring attendants at principal door, 280, 281.
- construed in connection with constitutional provision, 167.
- contributory negligence of miner no defense if willful violation, 182.
- create no liability for negligence, 255.
- crimes for disobeying, 201, 209, 228.
- daily examination with safety lamp required, liability for failure, 170, 171.
- damages recoverable against operator for violation of, 202, 209, 228, 229.
- dangerous conditions, application and construction of, 285, 286.
 - changes and construction of statutes, 296, 297.
 - examination of mine, amendatory act of 1899, 290.
 - in mine, application of, 283.
 - meaning, 283.
 - men not to enter, construction and meaning, 294, 295, 296.
 - requirements as to, 282, 297.
- delivery of cap pieces and props to miner required, 175, 176.
- different parts to be construed together, 266.
- dimensions of props and cap pieces must be suitable, 175.
- discharge of certified engineer not a violation of, 263.
- doors for ventilation, 278, 279, 280.
- duty imposed upon operator, 170.
 - of mine operator as to daily inspection, 171.
 - on discovery of violation, 177, 178.
- effort of legislature to comply with constitution for safety of miners, 168.
- employment of boys, construction and purpose of act, 318.
- enacted under mandatory requirements of constitution, 167.
- enactment for health and safety of miners, 169.
 - not for benefit of mine owner, 169.
 - pursuant to constitution, 247.
- escapement shaft required, 172.
 - under constitutional provision, 168.
- evil intent not a necessary ingredient of willfulness, 178, 180.
- exercise of police power for safety of miners, 169.
- extent of daily inspection of mine, 254.
- failure of operator to comply with, liability, 177-180, 228, 229.
 - to maintain gates at shafts, willful violation, 266.
 - provide lights at top and bottom of shafts, 173
 - stairway in escapement shaft, willful violation, 172.
- four annual inspections required 172.
- frequency of inspections dependent on conditions, 168.
- gas explosion, willful violation of statute, liability of operator, 180.
- "giving out of machinery" within meaning of, 178.
- indictment for obstructing air shaft, sufficiency, 252.
- injunction to prevent mining operations on violation of operator, 201, 209.
- injury resulting from failure to comply with, liability, 177.
- inspection authorized for health and safety of miners, 169.
 - fees legally imposed upon operators, 248.
 - not authorized for benefit of mine owner, 169.
- inspector's duty on operator's violation, 202, 209, 228.
- legislation required for protection of miners, 3.
 - with reference to classification of mines, 163.
- liability of operator for violation, 228, 229.
- liberal construction of laws for protection of coal miners, 3.
 - requirements as to props and timbers, 271.
- lights on coal cars, application and meaning of requirements, 270, 271.
- limitation as to fencing shafts of coal mines, 173.
 - of actions against operator for violation of, 202, 209.
- marking dangerous conditions as notice to miners, 170.
 - required, 170.
- miners can not waive, provisions by contract, 183.
 - not permitted to enter mine until conditions safe, 171.
- mines employing less than five miners exempted, 169.
- mining operations enjoined on operator's violation of, 201, 209.

MINING STATUTES—Continued.

- noncompliance with requirements not willful failure to observe, 180.
- notice of nonobservance, duty of operator, 177.
- number of inspections can not be definitely fixed, 168.
- object to protect miners in coal mines, 168.
 - was safety to miners, 250.
- obstructing air shaft liability, 252.
- omission of duty as willful violation, 178-180.
- operator, disobedience as to shafts and ventilation, 201, 209, 228.
 - liability for injury on willful violation of, 202, 209, 228.
 - not required to prop roof, 170.
 - relieved from duty as to competency of mine examiner, 258.
 - violation, duty of inspector, 202, 209, 228.
- penalty of act of 1899 not applied to shot firers' act, 378.
 - for violation of, 201, 209, 228.
 - act of 1911, 228.
 - operator's disobedience, 201, 209, 228.
- personal safety of miners, 3.
- persons entitled to protection of, 252.
- placing conspicuous mark on dangerous conditions, 170.
- police power of State as to, 248.
- power of legislature to require maps of mines, 168.
- procedure on operator's violation, 201, 202, 209, 228.
 - to obtain survey of coal mine, 185.
- protection of miners, 2.
 - against dangers incident to mining, 248.
 - constitutional mandate, 4.
 - construction, 4.
- public policy prevents any dispensing with, 183.
- purpose as to ventilation, 311.
 - in requiring cross-cuts, 281, 311.
 - lights at landings, 264.
 - operators to employ certificated examiners and managers, 308.
 - to protect health and safety of miners, 249.
 - miners, 247.
- refuge places, provision, construction of, 268, 269.
 - requirements as to, 268, 269, 270.
- repealing effect, 186.
- repeal of act of 1877, exceptions, 186.
- requirements as to bottom man and top man, 176.
 - doors for ventilation, 278, 279, 280, 281.
 - fencing shaft, change from statutory method, 174.
 - inspection fee not in violation of constitution, 169.
 - not in violation of constitution, 169.
 - maps within legislative power, 168, 187, 207.
 - number of inspections, 168.
 - props, 27.
 - and cap pieces, 175, 176.
 - timbers, 271-277.
 - safe conduct of mining, 170.
 - safeguarding tops of shafts, 251.
- require mine owner to permit inspection for safety of miners, 159.
- roadway as used in, meaning and proof, 174.
- safeguarding health and lives of miners, 169.
- safe place, making dangerous place safe, 170.
- safety to miners required, 167.
 - statutes required by constitution, 167.
- shafts required under constitutional provision, 168.
- shot firers' acts, application and construction, 303, 304.
 - no part of general mining act, 378.
 - validity, 378, 379.
 - amendatory act, construction and purpose, 379.
- shot firers protected by, 379.
- specifications of things to be done to secure safety in mines, 317.
- stairways required in shafts, 156, 160, 173.
- statute requiring lights at top and bottom of shaft, 173.
- supply of timber by operator required, 173.

MINING STATUTES—Continued.

- survey of coal mine authorized by, 185.
- time given in which to construct escapement shaft, 173.
- top man required at shafts, 176.
- unlawful for operator to employ only certificated engineers, examiners, and managers, 228.
- validity of in requiring inspections, 168.
- ventilation required under constitutional provision, 168.
- violation as prima facie evidence of negligence, 311.
 - proximate cause of injury, 309-313.
 - to roadways, time to repair, 177.
 - signals between stopping places in haulage ways, 174.
- by agent, no recovery for injury, 183.
- failure to keep lights at shaft, liability, 173, 174.
- operator, basis of liability, 308.
 - risks not assumed by miner, 337.
 - vice principal, no recovery for injury, 183.
- concurring cause of injuries, liability, 313, 314.
- failure to show proximate cause, instances, 312, 313.
- for willfully failing to fence shaft, 173.
- in employment of uncertificated examiner, willfulness, 228.
- of and negligence, distinction, 316, 317.
- penalties, 201, 209, 228.
- proof and presumption, 314, 315.
- recovery for death or injury, 184, 228, 229.
- violations, instances of, 201, 209, 228.
- weighing coal at mines, application, 387.
 - purpose of act, 387.
 - required, 386.
- willful disregard by operator, recovery by negligent miner, 182.
- failure, neglect or refusal to obey, 201, 209, 228.
 - to comply with liability of operator, 202, 209, 228.
 - question of fact, 177, 178, 179, 182.
 - fence shafts, liability, 173.
 - light shaft, proximate cause, 174.
- meaning as used, 179.
- violation, action for injury or death, 184, 228.
 - as proximate cause of injury, 177-180.
 - by agent, operator not liable, 178.
 - operator, contributory negligence of miner, 182.
 - "direct damages," meaning, 310.
 - does not involve good faith, 256.
 - effect of noncompliance, 180.
 - employment of uncertificated examiner, 228.
 - failure of miner to exercise care, recovery, 181.
 - to cover cage, 261.
 - in employment of boys, operator liability, 318, 319.
 - failing to furnish lights at shaft, 266, 267.
 - meaning, 305.
 - mistakes of examiner not, 254.
 - of, liability, 202, 209, 228.
 - proof, 179, 180.
 - proximate cause of injury, 179, 180.
 - recovery for wrongful death, 184, 228.
 - what constitutes, 305, 306, 307, 308, 309, 310, 311-317, 447, 468.
- workmen's compensation acts, 394, 403, 418.

MINORS.

- See also Boys, Coal mine operator, Girls, Mining statutes.
- conditions for employment, 198, 205, 228.
- employment of authorized, 198, 205.
- persons under 14 years of age not to be employed in mines, 129, 148.
- 16 years of age not to be employed in coal mines, 228.
- 12 years of age not to be employed in mines, 132, 133, 134, 142.

N

NEGLIGENCE.

- See also Coal-mine operator, Miners, Mining operations.
- action for, averment as to exercise of due care by plaintiff, 335.
- amendment changing action from to one for violation of statutes, 316.

NEGLIGENCE—Continued.

- causal relation between act and injury, 317.
- death of miner, defeated action for violation of statute *no defense*, 326.
- definition of, 318.
- distinction between and violation of statute, 316, 317.
- evil intent must be shown to establish, 316.
- gross as want of use of ordinary care, 180, 181.
- liability of operator *for*, 316.
- no statutory declaration of, 317.
 - liability for, 316, 317.
- not involved in action for violation of statute, 317.
- operator's knowledge of condition essential to, 318.
 - liability, care exercised by miner, 180, 181.
- proof of will not justify recovery in actions under statute, 317.
 - to sustain different from proof to show violation of statute, 316, 327.
- right of action for, not affected by workmen's compensation act, 603.
- statutory and common law liability of operator, 317, 318.
- violation of statute as actionable, 317.
 - more than, 316.
- willful failure to comply with statute, recovery by injured miner, 180, 222.
- negligence as misnomer, 317, 318.

NITROCHLORATE.

- See Explosives.
- manufacture, sale, storage and transportation regulated, 12, 13, 14.

NITROGLYCERINE.

- See also Explosives.
- act relating to, 11-17.
- manufacture, sale, storage and transportation regulated, 12, 13, 14.

NOTICE.

- accidents in mine and result of coroner's inquest, 227.
- of rules to be posted at mine entrance, 226.
- to owners on appropriation of land, 6.
- unlawful for miner to deface or destroy, 226.

NUISANCE.

- See also Explosives, Mining operations.
- explosives as, 11.

O

OIL AND GAS WELLS.

- abandonment and plugging, 356, 357.
- act in relation to sinking, filling, and operating, 356, 357.
- affidavit filed in recorder's office as to plugging, 356, 358.
- distance from mine to be drilled, 357.
- driller to case off fresh water from well, 357, 358.
- drilling into coal seam, duty of driller, 357.
 - map to be filed, 357.
 - within 250 feet of mine shafts prohibited, 357.
- map to be filed on drilling into coal seam, 357.
- method of filling and plugging, 356, 357.
- penalty for violating provisions as to drilling or plugging, 357, 358.
- plugging, penalty for failure to, 357, 358.
 - required, 356, 357.
- water to be cased off from, 357, 358.

OIL INSPECTORS.

- act for inspection and sale of mineral oils, 346.
- appointment of, 346-353.
- dealer, manufacturer, producer or refiner must give notice to inspector of oil to be inspected, 346, 348, 349, 350, 353.
- duties of, 346-353.
- inspection of oil, duty of inspector, 346-353.
- inspector to mark barrels, casks or packages, 347, 349, 353.
- inspection of oil for illuminating purposes, 346.
- oath of office, 346, 347, 349-353.
- oil inspection, 346.
- penalty for failure to have oil inspected by, 347, 350, 353.
 - falsely branding, barrels, casks, or packages, 347, 348, 350, 353.
 - sale without inspection, 347, 348, 350, 353.
- pyrometer used in making tests of oil, 346-353.

OIL INSPECTORS—Continued.

- record of inspection to be kept in book, 346, 348, 349, 353.
- open for inspection, to parties interested, 346, 348, 349, 353.
- salary of, 346-353.
 - payment, 346, 347, 351, 352.
- term of office, 346, 347, 349, 350, 351, 352, 353.
- testing oils on request, 346-353.
- use of barrel, cask, or package with inspection brand without having oil inspected, penalty, 347, 348, 350, 353.

OILS.

- See also Coal-mine operator, Explosives, Miners, Mine inspectors, Mine managers, Mining operations, Safety lamps.
- act requiring use of pure oil in coal mines, 354, 355.
 - to suppress gambling in oil, 354.
- barrels or packages to be stamped or branded, 221, 234.
- branding original package, 221, 234.
- brands of, 221, 234.
- closed receptacles for in mines, 232.
- duty of mine inspector to inspect, 354, 356.
- fine for selling below test, 221, 234.
- gambling in petroleum, 354.
- heating over fire or lamp prohibited, 232.
- hydrometer used in testing, 354, 356.
- illuminating, inspection and use, 354, 355.
 - specifications for, 221, 234.
 - tests required, 354, 355.
 - to be contained in branded barrels or packages, 355, 356.
 - use of permitted, 355, 356.
- illuminants must conform to specifications, 221, 234.
- mine inspectors' duty to obtain and test, 221, 234.
- oils used in coal mines, regulations and test, 354.
- penalty for selling, not complying with specifications, 221, 234.
 - using below test, 221, 234.
 - impure, 355.
- pure only to be used in coal mines, 354, 355.
- sampling and testing, 221, 234.
- specifications prescribed by State mining board, 221, 234.
- standard of, 221, 234.
- storing within 100 feet of shaft prohibited, 232.
- Tagliabue hydrometer used in testing, 354, 355.
- test, method of, 354, 355.
- tested only to be used in coal mines, 354, 355.
- vegetable oils, use permitted, 355, 356.

P**PASSAGEWAYS.**

- See also Gangways, Haulageways, Mine fire fighting equipment, Roads and roadways, Shafts.
- around bottom of shaft, 188.
- communicating with escapement shaft, 189.
- dimensions, 189.
- drained and graded, 189.
- extending from haulageways to exits, 189.
- free from obstructions, 189, 190.
- freedom from obstruction required, 253.
- inspection and report as to obstructions, 190.
- means of communication with contiguous mine, 189.
- traveling way for men and animals at bottom of shaft, 188.
- water to be kept out of, 189.
- weekly inspection required, 190.

PERMISSIBLE EXPLOSIVES.

See Explosives, Powder.

PIPES.

- See also Drainage of mines, Mine fire fighting equipment.
- requirements in mine fire fighting equipment, 33-46.
- right of way for draining mine, 5-9.

PIT BOSS.

See also Mine managers, Miners' examining board.
 certificate of qualification required, 54, 55.
 competency and qualification, 54, 55.
 examination for certificate, 54, 55
 experience in coal mines, 54, 55.
 same as mine manager, 202.

PLACES OF REFUGE.

See Refuge places.

POLICE POWER.

See also Inspection and examination of mines, Legislature, Mine inspectors, Mining operations, Mining statutes.

legislature may exercise as to inspection of mines, 169.
 mining statutes valid exercise of, 169, 248.
 regulation of hours of labor of miners within, 169.
 mines within, 169.
 statute requiring payment of inspection fees is exercised of, 169.

POWDER,

See also Explosives, Mining operations, Powder magazines, Ventilation.

act concerning use in coal mine, 15, 16, 17, 221, 234.

 regulating use of black powder in coal blasting, 16.

amendatory act, use in coal mine, 16.

black powder, act regulating character sale and use in coal mines, 17.

 authority of mine inspector to sample, 17.

 crime in use of, 17.

 granulation and determination, 16.

 moisture content, 16.

 regulations in blasting coal, 16, 17.

 samples for testing, 17.

 sizes of granulations, 16.

 specific gravity, 16.

 specifications and test, 16, 17.

 stamping packages, 16, 17.

 testing for granulation, 17.

blasting coal, quantity used, determination, 16.

 in coal mine, 15, 16, 17.

crime as to use in coal mines, 15, 18.

permissible explosives, act regulating, 17.

quantity regulated in blasting coal, 15, 16, 17, 18.

regulation as to use, 197, 210, 211, 221, 234.

storage in mines, 197, 210, 211, 221, 234.

tamping in drill hole, 15, 222, 236.

use as to "dead" hole, 15, 222, 235.

 in blasting coal regulated, 15, 16.

POWDER MAGAZINES.

See also Coal-mine operator, Explosives, Miners, Mining operations, Mining statutes.

act regulating location, 11-17.

fireproof building required, 191.

location on surface, 191.

 with reference to shafts, 190.

powder house, 190, 191.

storing explosives in, 191.

PROPS.

See also Coal-mine operator, Miners, Mining operations.

application and meaning of statutory requirement, 272.

as demanded must be furnished, 175.

cap pieces, supply to be kept, 146, 158.

coal-mine operator must furnish props of sufficient dimensions, 175.

 required to keep a supply, 146, 158.

custom adopted by operator for making demand binding, 275, 276, 277.

 as to demand on timberman, 275.

 place of delivery, 271.

 to demand of drivers, 272.

delivery in compliance with statute, question of fact, 272.

 of as required by miner, 271.

 to miner by mine manager, 194.

 required, 175.

PROPS—Continued.

- "demand" and "require" use of in court's instructions, 275.
- by miner, care required, 181.
- for according to custom of mine, 275, 276, 277.
 - rule adopted by operator, 275, 276, 277.
 - by miner not specific, effect and liability of operator, 275.
 - must be specific to create liability, 273.
 - on driver, absence of proof of custom, 277.
 - required of miner, 175.
 - sufficiency, 272.
 - of miner for such as are required, 274.
 - must designate kind and dimensions, 274.
- dimensions must be sufficient, 175.
 - to be specified by miner, 271.
- duty of miner and liability of operator, questions of fact, 273.
 - mine owner to keep on hand, 146, 153.
 - miner to demand and set, 274, 275.
 - operator to furnish, 175, 176.
 - propping imposed on miner, 176.
- excuse for operator's failure to furnish, 272.
- failure of coal mine operator to supply on demand, 175.
 - deliver according to custom, 271, 272.
 - furnish, no liability on ground of negligence, 272.
 - proof to establish liability, 272.
 - willful violation of statute, 272.
 - timber boss to supply, liability of mine operator, 175.
 - to supply, willful violation of statute, 175, 176.
- judicial notice as to necessity for props, 176.
- method of making demand adopted by operator, binding, 275, 276, 277.
- mine manager's duty as to, 224, 237.
 - failure to furnish, liability of operator, 272, 273.
- miner in class denominated "workman", 271.
 - injured while setting, right to recover, 275.
 - as judge of necessity for, 176.
 - demand for, upon mine manager, 272, 273.
 - duty to place, 176
 - secure working place, 273.
 - knowledge as to looseness of coal is not negligence, 275.
 - only can complain for failure of operator to furnish, 274.
 - to determine length and dimensions of, 274.
- negligence in delivering insufficient, liability, 273.
- operator bound by custom as to demand, 275, 276, 277.
 - duty to furnish, 271.
 - miner's duty to place, 273.
 - keep supply, 271.
 - liability for failure to furnish where demand is not specific, 275.
 - violation of statute, proof insufficient to establish, 275.
- purpose of statutory requirements as to, 274.
- request for, made to drivers, sufficiency, 272.
- statutory duty of miner to prop roof, 176.
- sufficiency of demand, 275.
- supply of, must be kept on hand, 175.
 - timber for, required, 146, 153.
 - provided by mine manager, 194.
- timber for, to be kept, 146, 153.

PROXIMATE CAUSE.

- See also Assumption of risk, Coal-mine operator, Contributory negligence, Miners, Negligence, Mining operations, Shot firers.
- absence of bottom man not, 265.
 - refuge places, not cause of injury, 270.
 - light on coal cars, not cause of injury, 271.
- as cause of injury, question of fact, 340.
- contributing proximate cause, liability of operator, 313, 314.
- death of miner, violation of statute, 138.
- defined, 309, 310.
- excessive rate of speed of cage as, proof, 265.
- failure of mine manager to mark dangerous condition, 340.
 - question of fact, 340.

PROXIMATE CAUSE—Continued.

- failure to comply with statute, as, 138.
 - equip cages with safety cages, not, 264.
 - keep haulageway clear of refuse as, 264.
 - maintain lights as, question of fact, 266.
 - provide passageway at bottom of shaft, 262.
- miner's knowledge of necessity of props not, 275.
- negligence of engineer, 175, 312.
- operator's failure to furnish ventilation as, 273.
- probable cause as, 340.
- proof of failure to comply with statute, 317.
 - to sustain recovery, 310, 311.
- question of fact, 314, 319.
 - as to cause of injury, 340.
- shot firing as, question of fact, 340.
- violation of statute, abstracts of decisions relating to, 309-313.
 - acts of miners as, 333.
 - as, 309-313, 340.
 - casual relation between act and injury, 317.
 - failure to show, instances, 312, 313.
 - instances, 309-313.
 - not, 264.
 - question of fact, 340.
- what constitutes, 309, 340.
- willful violation of statute as, 138.

R

RAILROADS.

- See also Coal banks, Constitution, Eminent domain, Rights of way.
- construction of, to coal bank, 4.
- horse and dummy leading to mine, 7.

RECORDS.

- See also Certificates, Examination of miners, Inspection and examination of mines, Mine examiners, Miners' examining board, Mining operations, Reports, Shot firers, State mining board, Weighing coal.
- book of, reports of examination of mine, 223, 236.
- daily, required of, examination of mine, 225, 238.
- mine examiner's, examination by mine manager, 223, 236.
 - duty to make, 223, 224, 236, 238.
 - in book, 225, 238.
 - of air currents, 225, 238.
 - to keep in special book, 223, 224, 237.
- of daily inspection of mine required, 156, 161.
 - examination of mine, open for inspection of miners, 223, 236.
 - measurement of air current to be preserved, 196, 206, 224, 237.
 - proceedings required, 93, 96, 98, 100, 103.
- shot firing, 376, 377.
- weight of coal at mines to be kept, 388, 390, 393.

REFUGE HOLES.

- See refuge places.

REFUGE PLACES.

- See also Coal-mine operator, Gangways, Haulageways, Inspection and examination of mines, Mine inspectors, Mining operations, Passageways.
- absence of, not proximate cause of injury, 270.
- additions to common-law duties, 269.
- at bottom of cage room in shaft mine, 217, 231, 213.
 - shaft bottom, 217, 231.
- construction of statute requiring, 268, 269.
- dimensions required, 198, 210, 220, 243, 244.
- distance apart, 198, 210, 217, 220, 231, 243, 244, 269.
- distance from hoisting shaft, 217, 232, 243.
- duty and liability of operator, 268.
- engine planes, required on, 198, 209, 210.
- failure of mine operator to make as willful violation of statute, 268.
 - to make, proof to establish liability, 270.
- haulageways required on, 268.
- liability of operator for failure to make, 174, 209, 270.
- manway as substitute for, 270.

REFUGE PLACES—Continued.

- meaning of requirement, 268.
- miners leaving, governed by rules of mine, 217, 232.
- mule roads, required on, 198, 209, 220, 244.
- must be kept clear of obstructions, 221, 244.
- not required in room necks, 221, 244.
- obstructions in prohibited, 198, 210, 221, 244.
- option of operator to leave clear space or make, 270.
- passageway on each side of track not required, 270.
- required for trappers, 196, 197, 203, 206.
 - on haulage roads, 198, 209, 220, 243.
 - where hauling is done by animals, 198, 209, 210, 220, 244.
 - machinery, 198, 209, 210, 220, 243.
- inclined planes, 269.
- power haulage roads, 220.
- roadways where miners travel on foot to work, 198, 209, 210, 243.
- requirements as to, 198, 209, 220, 243, 244.
- safety in entries required, 209.
- size of, 220, 243, 244.
 - approved by inspector, 217, 231, 243.
- storage of material in prohibited, 198, 210, 221, 244.
- when and where required, 268.
 - not required, 198, 210, 221, 244, 269.
- whitewashing once each six months, 221, 244.

REPORTS.

- See also Annual coal report, Geologist, Geological commission, Geological survey, Hoisting engineers, Inspection and examination of mines, Mine accidents, Mine examiners, Mine fire fighting and rescue stations, Mine inspectors, Mine managers, Miners' examining board, Mining investigating commission, Mining operations, Oil and gas wells, Oil inspectors, Records, Survey of mines, Ventilation, Workmen's compensation act.
- appropriation for distribution, 22, 23.
- blanks to be furnished coal operators, 76, 83, 89.
- certified copies to be furnished, 245.
- contents of by mine examiner, 172.
- duty of coal operators to make, 76, 83, 89.
 - mine inspectors to make, 76, 83, 89.
- failure of mine inspectors to make, 76, 83, 89.
- geologist required to make, 21-23.
- in book containing printed blank, sufficiency, 172.
 - examiner's as to dangerous places in mine, 172.
- mine inspector required to make, 193.
 - rescue commission to make, 29, 30, 21.
- operators of coal mines to make, 76, 83, 89.
- penalty for failure to make, 77, 83, 89.
- printing of mine inspector's, 193.
- publication of mine inspector's, 193.
- State geologist's, 21-23.
- sufficiency as to dangerous conditions in mine, 172.

RESCUE WORK.

- See Mine fire fighting and rescue stations, Mine rescue work.

RIGHTS OF WAY.

- See also Ditches, Drainage of mines, Eminent domain, Roads and roadways.
- ditches and pipes for draining mines, 5-9.

ROADS AND ROADWAYS.

- See also Eminent domain, Gangways, Haulageways, Inspection and examination of mines, Mine inspectors, Mine managers, Mining operations, Mining statutes, Ventilation.
- between shafts to be patrolled, 190.
- construction for use of mine, 6, 7.
- dangerous conditions in, 238.
 - obstructions in, 225.
- dusty to be sprinkled, 194.
- examinations of to be marked, 225, 238.
- improper construction, duty of mine operator, 177.
- leading to mine, 7.
- liability of mine operator for injuries caused by obstruction, 174.
- marking as evidence of examination, 225, 238.
- meaning and proof, 174.

ROADS AND ROADWAYS—Continued.

- mine manager's duty to examine, 224, 237.
 - failure to sprinkle, willful violation of statute, 309.
- obstructions on the sides of tracks, 174.
 - to be removed, 194.
- record of removal of obstructions from required, 194, 224, 237.
- refuge holes required on, 198, 210.
- requirement as to connecting mines, 142, 147, 152, 155, 160, 174.
 - in connection with construction of shaft, 142, 147, 152, 155, 160, 174.
- sprinkling required, 194, 197, 211, 220, 224, 234, 236.
- violation of statute in construction, duty of operator, 177.
- width of, 142, 147, 152, 155, 160, 174.

RULES.

- See also Coal-mine operators, Miners, Mining corporations, Mining operations
- abandonment, question of fact, 257.
- adopted by operator for making demand for proofs binding, 275, 276, 277.
- adoption and posting by operator, 201.
 - compliance with statute, 256
- coal-mine operator must adopt and post, 256.
- conflict with State laws, effect, 257.
- miners charged with knowledge of after posting, 201.
- sufficiency and substitution for loss, 256.

S

SAFETY LAMPS.

- See also Coal mine operator, Miners, Mining operations, Oils.
- care of, 201, 218.
 - by mine manager, 200, 218.
- carrying open lights into places worked by unlawful, 226.
- consent of mine manager or inspector to use other lights, 220, 233.
- custody of in mine manager, 201, 218.
- Davy lamps used for testing, number to be provided by operator, 218.
- duty of operator on receiving notice of inspector to use, 200, 218.
- electric lamps permitted, 219.
- evidence of competency to use, 218, 219.
- exclusive use without consent of mine manager or inspector, 220, 233.
- fire prohibited in connection with, 219.
- inspector's consent to use other lights, 220, 233.
- matches prohibited in connection with, 219.
- mine manager's consent to use other lights, 220, 233.
- miners responsible for, 201, 213.
 - condition of, 201, 218.
- notice of inspector to operator to use, 200, 218.
- opening locked without permission, unlawful, 226.
- operator must furnish, 200, 218.
- persons competent to use, 218, 219.
 - using not to have fire or matches, 219.
- possession of matches prohibited, 219.
- regulations as to use, 218, 220, 446.
- use of, 201, 218.
 - in case of fire damp, 200.

SAFETY PLACES.

- See Refuge holes.

SALINES.

- See also Minerals, Mineral lands.
- acceptance of by State, 359.
- act for leasing Jackson County saline, 373.
 - relating to Big Muddy, 365.
 - Gallatin County, 362, 366, 369, 371, 374.
 - Vermillion, 364, 365, 370.
 - to encourage discovery of salt water, 360.
 - manufacture of salt, 369, 372.
- acts relating to, 359-373.
- appropriating sums received from sales of, 368.
- coal lands in, sale of, 374, 375.
- discovery of, 360.
- fencing off required, 365.
- Gallatin County, 362, 363, 366, 369, 371, 374.

SALINES—Continued.

- governor authorized to lease, 360, 361, 363, 365, 369, 373, 374.
 - sell coal lands within, 374, 375.
 - salt wells, 374, 375.
- Jackson County, 373.
- leasing by legislature, 359, 360.
 - of Big Muddy, 365.
- manufacture of salt encouraged, 369, 372.
- penalty for failure to fence saltpeter caves, 359, 360.
- relief of certain lessees, 364.
- rents from, 361.
- sales appropriating sums received, 368.
- salt springs, 359.
 - wells, governor to sell, 374.
- saltpeter caves, manner of working, 359.
 - to be enclosed, 359.
- Vermillion salines, 364.

SALT AND SALT WATER.

See Salines.

SALTPETER.

See Salines.

SCALES.

See Mine inspectors, Weighing coal.

SHAFTS.

- See also Boilers, Cages, Coal-mine operator, Gates, Hoisting and hoisting equipment, Mine examiners, Mining operations, Mining statutes, Passageways, Signals, Stairways, Ventilation.
- abandoned shafts to be fenced and protected, 130, 143, 158, 161.
- additional time for construction, 137, 142, 147, 152, 155, 160, 189, 215, 240.
- angle of stairways required in, 156, 160, 172, 190, 215, 240.
- appliances used while sinking, requirements, 214.
- application of statute as to time for construction, 173, 215, 240.
 - to, 252.
 - limited to shafts of coal mines, 173.
 - requiring to coal mines, 173.
- automatic gates, 189, 215, 230, 241.
- blast in shaft sinking to be exploded by electricity, 214.
- bottom and top man required, 176, 200, 218.
 - as a "landing" requiring lights, 267.
 - man required, 176, 200, 218.
- bucket to be kept from swinging, 214.
- buildings on surface between main and escapement shaft prohibited, 190, 217, 232.
- coal and material to be removed from top, 251.
 - mine operator required to fence, 170, 189, 241.
 - not to be hoisted in while miners are going in or out, 130, 134, 148.
- code of signals to be posted at top and bottom, 158, 216, 230, 243.
- common use of by different mine operators, 173, 241.
- communication in each stratum of coal, 123, 133, 142, 147, 152, 155, 160, 215, 241.
 - between contiguous mines not to be closed, 215, 241.
 - with adjacent mines, 190, 215, 241.
- construction of escapement shafts required by legislation, 168.
 - required in mines employing more than 6 miners, 172.
 - 10 miners, 215, 240.
- covering and protecting required, 130, 143, 158, 161, 214, 240, 241.
 - required while being sunk, 214.
- definition of, 202, 229.
- daily visit to bottom by mine examiner, 243.
- death of employee while sinking, liability of operator, 253.
- depth of mine, time for construction of shaft, 137, 142, 147, 152, 155, 160, 189, 215, 240.
- dimensions of passageways between, 215, 241.
- distance of escapement, from main shaft, 189, 214, 240.
- duty of bottom and top man, 176, 200, 218.
 - coal mine operator as to gates, 139, 143, 158, 161, 189, 215, 239, 241.
 - to provide lights for, 137, 158, 161, 215, 230, 241.
 - owner or agent in relation to construction, 129, 133, 134, 142, 147, 152, 155, 160, 214, 215, 240.
 - to erect gates at top of shaft, 138, 143, 158, 161, 189, 215, 230, 241.
 - fence, limited to coal mines, 173.
 - keep gates of shaft closed, 138, 143, 158, 161, 215, 230, 241.
 - maintain, imposed on operator, 253.

SHAFTS—Continued.

- entrance to, must be protected, 137, 143, 158, 161, 189, 241.
- escapement, and place of exit mean the same, 253.
 - purpose, and application of statute, 252.
 - required, 3, 128, 133, 142, 147, 152, 155, 180, 188, 189, 214, 215, 240.
- failure to comply with statute requiring, operations enjoined, 228.
 - fence, willful violation of statute, 177.
 - provide stairway, willful violation of statute, 179, 215.
- fences or gates required at top, 178, 189, 215, 238, 241.
- fencing, application of statute, 173.
 - at landing, 266.
 - limited to coal mine, 173.
 - required, 130, 143, 158, 161, 189, 215, 239, 241.
- fireproof construction, 36, 40, 44, 46, 46.
 - at bottom, 36, 40, 44, 46.
- gates accidentally open, liability, 139, 143.
 - and cages, 266.
 - at top, 189, 215, 230, 241.
- general equipment, 189, 215-217, 230-232, 240, 241.
 - while sinking, 214.
- hoisting and lowering men, regulations, 200, 214, 215, 241, 242.
 - material while sinking, regulations, 214.
- include vertical openings for escapement, hoisting, or ventilation, 202, 214, 215, 220.
- inspection during sinking, 214.
 - each week required, 190, 217, 232, 243.
 - while in process of sinking, 188, 214.
- insufficient time for constructing, duty of operator, 139, 150, 160.
- "landing" meaning, 267.
 - platforms constructed while sinking, 214.
- laws providing for, required by constitution, 3.
- legislature may require construction of escapement shafts, 168.
- liability for willful failure to construct, defense, 173.
 - of operator for failure to erect gates, 138, 143, 158, 161.
 - protect entrance to, 137, 143, 158, 161.
- lighting, duty and liability, 266.
 - question of fact, 266.
 - required, 137, 158, 161, 215, 230, 241.
- lights on landings when hoisting and lowering men at night, 200, 215, 230, 241.
 - to be at top and bottom landing when miners are hoisted or lowered, 195, 215, 230, 241.
- main shaft, requirements as to, 188, 189, 214, 215, 240.
- materials used in construction to be fireproof, 36, 40, 44, 46.
- meaning of term, 252.
- mine examiner to visit bottom daily, 243.
 - operated without, working prohibited, 172, 215.
- object of statute in requiring lights at landings, 267.
- obstructions in, not permitted, 190, 217, 232, 243.
- passageway around bottom, 188, 215, 217, 231, 243.
 - not part of shaft, 253.
 - to escapement shafts, 189, 215, 241.
 - graded and drained, 215, 241.
- penalty for obstructing air shaft, 252.
 - violating provision as to hoisting, 139, 135.
- pits and holes not, 173.
- posting code of signals at top and bottom, 158, 216, 231.
- powder magazine, location with reference to, 190.
- proof of failure to provide lights, 137, 158, 161.
- required between contiguous mines, 128, 133, 142, 147, 152, 155, 180, 189, 215, 241.
- requirement where mines are connected, 173, 189, 215, 241.
- roadways between, to be patrolled, 190.
- runaround at bottom required, 217, 231, 243.
- sheaves or pulley ropes supported while sinking, 214.
- signals, code of, to be posted at top and bottom, 158, 216, 231, 242.
- sign boards on passageways to, 215, 241.
- sinking, certificated engineer in charge of hoisting engine, 214.
 - liability of operator for injuries, 262.
 - regulations and requirements, 214.
 - subject to inspection, 188, 214.

SHAFTS—Continued.

- size of run-around at bottom of 217, 231, 243.
- speed of cages in, 200, 218.
- stairways required in, 156, 160, 172, 190, 215, 240, 241.
- statutory requirements as to top and bottom men, 176, 200, 218.
- sufficiency of lights, 200, 215, 230, 241.
- test of applicability of statute, 173.
- time for bottom and top man to begin and quit work, 200, 218.
 - construction, 129, 133, 134, 137, 142, 147, 152, 155, 160, 173, 189, 215, 240.
- top man required at, 176, 200, 218.
- travelingway at bottom of, 188, 215, 217, 231, 243.
- two places of egress required, 180, 214, 240.
 - required in each mine, 128, 133, 142, 147, 152, 155, 160, 189, 214, 240.
- underground communications between, 190, 215, 241.
- unlawful to employ more than 10 men without, 189, 215, 240.
- ventilation of while being sunk, 214.
- violation of provision as to hoisting, 130, 135.
 - statute requiring, operations enjoined, 228.
- weekly inspection of required, 190, 217, 232, 243.
- what constitutes, 173.
- willful failure to fence, liability, 173.

SHOT FIRERS.

- See also Coal-mine operator, Explosives, Mine inspectors, Miners, Mining operations, Mining statute, Powder.
- action for death, proof of prior condition of entry, 380.
 - subsequent condition of entry, 380.
- injuries or death, 379.
- act of 1890 modified by act of 1905, 303, 304.
 - requiring coal mine operators to furnish, 376, 377, 378.
- acts relating to, construction, nature and validity, 378, 379.
- amount of powder used for single blast, 303.
- application of act of 1890 to, 379.
 - statute, 303, 304.
- blasting, certain persons permitted to remain in mine, 377.
 - hole, tamping, 223, 236.
 - in coal mine, 15, 16, 17.
 - prohibited until miners are out of mine, 376, 377.
- change of drill hole after approval by, prohibited, 377.
- certificate holder not employed as, 67.
- classification of by act of 1905, 379.
- coal dust not to be used for tamping, 223, 236.
 - mines in which operators are required to furnish, 376, 377, 378.
- construction of statutes relating to, 303, 304.
- contributory negligence of, no defense to action, 332, 333.
- copper tools only for tamping, 222, 235.
- dead hole, defined, 222, 235.
 - drilling or shooting prohibited, 378.
 - is one whose heel is not strong enough to balance the resistance, 378.
 - not to be shot, 222, 235.
- determination as to practical and workmanlike manner of shots, 379.
- drill holes for firing shots to be approved by, 377, 378.
- drilling or shooting dead holes prohibited, 377, 378.
- duties, 376, 377, 378.
- employment at expense of operator, 376, 377, 378.
- employment by coal mine operator, 379.
- experienced practical miners to be employed as, 376, 377, 378.
- "heel" is part of the shot lying outside of powder, 378.
- inflammable material not to be used for tamping, 223, 236.
- judgment of as to manner of preparing shots, 379.
- liability of operator for death of, 255.
- missed shot, 223, 236.
 - requirements as to, 223, 236.
 - time for returning to, 223, 236.
 - withdrawn by copper or wooden tools, 223, 236.
- mixed shot, prohibited, 222, 235.
- negligent, operator's violation of statute, liability, 304.
- notice of number of shots fired to be posted, 376, 377, 378.
 - to be posted on completion of work, 376, 377.

SHOT FIRERS—Continued.

- not more than one shot at a time to be lighted, 223, 236.
- number to be employed, 376, 377, 378.
- operator's required to furnish, 376.
- penalty for willful neglect to discharge duty, 376, 377.
 - of act of 1899, not applied to, 378.
- proper, practical, and workmanlike shots only to be fired, 377, 378.
- protected by general mining statutes, 379.
- protection of statute as to contributory in negligence, 332, 333.
- record of blast to be kept by mine manager, 376, 377.
- scraper not to be used for tamping, 222, 235.
- smoke to clear away between shots, 223, 236.
- tamping blasting hole, 223, 236.
 - with scraper prohibited, 222, 235.
- three shots only ahead of crosscut, 445.
- time between shots, 223, 236.
- unlawful shot prohibited, 378.
- use of squibs requirements, 223, 236.
- violation of statute relating to, penalty, 376, 377.
- warning before firing shot, 223, 236.
- withdrawing missed shots, 223, 236.

SIGNALS.

See also Cages, Coal-mine operator, Electrical appliances, Hoisting and hoisting equipment, Haulageways, Mining operations, Lights, Mine fire-fighting equipment, Mining statutes, Notice, Shafts Telephone.

- additions by operator permitted, 266.
 - to code of signals permitted, 157, 216, 230, 242.
- bell signal code, 157.
- cage equipped with signal, 35, 157, 216, 230, 242.
- coal-mine operator may increase efficiency with consent of inspector, 266.
 - required to adopt code, 157, 216, 230, 242.
- code of, 157, 198, 204, 216, 230, 242.
 - must be posted, 192, 216, 231, 242.
 - required and to be posted, 192, 216, 231, 242.
 - required on gangways and roadways, 198, 210.
 - signals must be posted at top and bottom of shaft, 158, 216, 231, 242.
 - to be posted at top and bottom of shaft, 198, 199, 204, 216, 231, 242.
 - in engine room, 199, 204, 216, 231, 242.
- construction of statute as to, 266.
- danger signals, 35, 157, 216, 230.
- device for cage signal, 35, 157, 216, 230, 241.
- display of, at dangerous places in mine, 194.
 - for hoisting engineer, 191, 242.
- duty of mine operator to provide, between bottom and top, 129, 132, 133, 134, 142, 147, 157, 216, 230, 242.
- electric gong, 35.
- hoisting engineer must know code of, 195, 226.
- horn for cage signal, 35, 216, 230, 241.
- iron pipes or tubes in wood required, 204, 242.
- kinds required, 204, 216, 230, 242.
- knowledge of, by hoisting engineer, 195, 226.
- liability of coal-mine operator for failure to provide, in haulageways, 174.
- means of, between top and bottom man required, 198, 204, 218, 242.
- mine inspector must see that code of, is posted, 192, 216, 231.
- on rope haulage roads required, 221, 243, 244.
- operator may add to code of, 198, 204, 216, 230, 242.
- penalty for violating act, 129, 132, 133, 134.
- posting code at top and bottom of shaft, 158, 216, 231, 242.
- punishment for failure to post code, 158.
- red light on rear of trip of cars, 221, 244.
- required in case of danger, 36.
 - coal mines between top and bottom, 129, 132, 133, 134, 142, 147, 157, 216, 230, 242.
 - gangways and haulageways, 198, 210, 243.
- system of danger signals, 35, 157, 216, 230, 242.
- violation of statute requiring, 158.
- white light on front of trip of cars, 221, 243.
- signal board on rear car of trip, 221, 244.

SPRINKLING.

See Coal mines, Mine fire-fighting equipment.

STABLES.

See also Coal mines, Mine fire-fighting equipment, Mine inspectors, Mining operations, Ventilation.
air current from, not to pass to working places, 196, 206, 220, 233.

for ventilation not to pass through, 446.

daily examination by mine manager required, 196.

fireproof construction, 443.

location, 443.

STAIRWAYS.

See also Mining statutes, Shafts.

angle of, in shafts, 156, 160, 172, 190, 215, 220.

handrails to, required, 215.

landings or platforms at each turn, 215.

STATE GEOLOGICAL COMMISSION.

See Geological Commission.

STATE GEOLOGICAL SURVEY.

See Geological survey.

STATE GEOLOGIST.

See Geologist.

STATE INSPECTOR OF MINES.

See Mine inspector.

STATE MINING BOARD.

See also Inspection and examination of mines, Mine inspectors, Miners' examining board.

acts relating to, 62, 65, 66, 67, 70, 77, 84.

appointment and duties, 62, 65, 66, 67, 70, 77.

appropriations for, 51, 90, 91.

meetings, 62, 66, 68, 73.

purpose of appointment, 62, 65, 67.

STATUTES.

See Mining statutes.

STRETCHERS.

See also Coal-mine operator, Mine accidents, Mine fire-fighting and rescue stations, Mining operations.

number to be furnished by operator, 201, 227.

operator to furnish, 201, 227.

SURVEY OF MINES.

See also Coal mines, Inspection and examination of mines, Maps, Mine inspectors.

accuracy and date to be shown, 187, 207.

annual survey of coal mines required, 50, 188, 208.

complaint by land owner for survey, 60, 61.

cost and expenses, 60, 61, 128, 141, 147, 159, 188, 208.

of maps of coal mines, 50.

examination of mine, 60.

examiners appointed to survey mine, 60, 61.

Judge may appoint competent person to make, 185.

maps showing surface, 187, 207.

mine inspector may order survey of coal mines, 50, 188, 208.

mines subject to, 60, 187, 207.

mining board may order survey of coal mines, 50.

over line prevented, 60.

of abandoned mines required, 188, 208.

worked-out mines required, 188, 208.

penalty for failure of mine inspector to require, 50.

to permit, 60, 61.

plat of, not admissible in evidence as such, 185.

procedure to obtain, 60, 61, 128, 141, 147, 159, 188.

purpose of statute authorizing, 185.

record of, not required, 185.

report of, not admissible in evidence, 185.

special, extended on map, 188, 208.

ordered by inspector, 188, 208.

underground workings shown by maps, 187, 207.

SURVEYORS.

See County surveyors.

T**TAXATION.**

See also Coal mines, Mining property, Mining rights.

assessment of mining rights for, 344, 345.

assessment of oil and gas lease for, 345.

TAXATION—Continued.

- acts relating to assessment of mines and mining property, 381, 384.
- coal mine, 381.
- lease of oil and gas subject to, 345.
- minerals reserved subject to, 343, 345.
- mining corporations to list property for, 381.
- rights purchased after assessment of land, subject to, 345.
- reserved subject to, 344, 345.
- separated from land subject to, 343, 345.
- subject to, 343, 344, 345.
- oil and gas lease subject to, 345.
- purchase of mining right after assessment of land, 345.
- quarries, 381.
- reservation of minerals subject to, 343, 345.
- valuation of mine or quarry, 381.
- mining rights for, 344, 345.

TAMPING BARS.

- See also Coal-mine operator, Miners, Mining operations.
- copper-tipped only to be used by miners, 201, 221, 234.
- penalty for using iron tamping bars, 151.
- unlawful to use iron, 151.

TELEPHONES.

- lines required in coal mine, 35, 40.

TIMBER.

- See Coal mine operator, Mining operations, Props.

TOP MAN.

- See also Bottom man, Cages, Min: managers, Mining operations, Mining statutes, Shafts.
- duty to remain at post, 176, 218.
- mine manager to see that he is on duty, 224, 237.
- must be on duty when miners are hoisted or lowered, 185, 218.
- remaining at post after hoisting of coal ceases, 204.

TRACK SCALES.

- See Mine inspectors, Weighing coal.

TRESPASS.

- See also Coal banks, Mineral lands, Survey of mines.
- mining over line, 60, 61.
- on coal banks, 58.
- mineral lands, 60, 61.

TUNNELS, see Drainage of mines.

U

UNITED STATES BUREAU OF MINES.

- permissible explosives, grade established by, 17, 18.
- tests of explosives by, 18.

UNIVERSITY OF ILLINOIS.

- See also Miners' institutes.
- appropriations for mining engineering department, 10.
- department of engineering, course of instruction, 10.
- Department of Mines and Minerals to cooperate with, 439.

V

VENTILATION.

- See also Coal mines, Doors, Explosives, Haulageways, Inspection and examination of mines, Mine managers, Mining operations, Mining statutes, Passageways, Roads and roadways, Safety lamps, Shot firers.
- air courses, wrongfully opening prohibited, 132, 146, 301.
- currents and apparatus in mine manager's charge, 194, 224, 237.
- from stables not to pass to working places, 196, 206, 220, 233, 446.
- measurements of, 196, 206, 224, 225, 234, 237, 238.
- must precede opening of rooms, 197, 206.
- through mines, 196, 206, 219, 232, 445.
- to be forced throughout mine, 196, 206, 219, 232, 445.
- measured by mine manager, 194, 224, 234, 237.
- :plit, 196, 206, 219, 239, 445.
- for animals in mines, 196, 206, 219, 232, 445.
- men in mines, 196, 206, 219, 232.
- to circulate at each working place, 132, 142, 150, 153, 156, 161, 196, 206, 219, 446.

VENTILATION—Continued.

- airways and stoppings required, 194, 220, 233.
- amendatory act relating to, 445.
- amount of air increased, 445.
 - required, 142, 150, 152, 156, 161, 196, 206, 219, 232, 446.
- anemometers to measure air currents, 196, 206, 225, 238.
 - be used in measuring air currents, 194, 225, 238.
- application of act to coal mine, 445.
- attendants not required at automatic doors, 203, 206, 220, 233, 446.
 - required at doors, 196, 203, 206, 220, 233, 445.
- authority of inspector over, 197, 206, 219, 220, 233, 445, 447.
 - mine examiner over, 225, 238.
 - manager over, 196, 206, 219, 224, 233, 237, 446.
- automatic doors for required, 278, 279, 446.
- book kept for record of inspection, 156, 161.
- care in examination of working places, 446.
- contributory negligence of miner no defense to operator's liability for failure to furnish, 277, 446.
- cross-cuts, closing, material used, 446.
 - connecting air courses, 446.
 - distance apart, 446.
 - failure to make, willful violation of statute, 281.
 - location and distance from rib, 446.
 - required, 197, 206, 219, 233, 446.
 - purpose of statute, 281.
 - to be closed with stoppings, 197, 206, 219, 233, 446.
 - constructed by mine manager, 194, 219, 224, 233, 237.
- currents of air, direction, 156, 161, 219, 233.
 - in mines controlled, 156, 161, 219, 233
 - to be split, 446.
- daily inspection and record, of condition of mine, 156, 161.
- dangerous conditions at working places, 255.
- discretion of inspector, as to air currents, 156, 161, 197, 206, 219, 220, 233, 446.
- distance between cross-cuts, 197, 206, 219, 233, 446.
- doors, attendants required at, 278, 279, 280, 446.
 - failing to close a misdemeanor, 132, 146, 201.
 - required to close automatically, 196, 206, 220, 233, 446.
 - trappers required at, 196, 203, 206, 220, 233.
- duty as to, 142, 150, 152, 156, 161, 196, 206, 219, 224, 232, 237.
 - of mine owner as to, 129, 142, 150, 152, 156, 161, 196, 206, 219, 232.
 - operator to provide bore holes for, 129.
 - sufficient, 156, 161, 196, 206, 219, 232.
- failure to comply with statute requiring, operations enjoined, 228.
 - to provide sufficient, 156, 161, 196, 206, 220, 234.
 - increase, miners ordered out, 447.
- fan to be run day and night, 447.
 - used for, 196, 206, 234.
- firing shots, 446.
- furnace for, location of, 142, 150, 153, 157, 161.
- general requirements as to, 445.
- improper, miners ordered out, 447.
- inspector may order miners out of mine on improper, 197, 203, 220, 234, 447.
- insufficient, notice to operator to correct, 156, 161, 196, 206, 220, 234, 447.
- laws providing for required, 3.
 - by constitution, 3.
- legislature may require in coal mines, 168.
- liability of operator for failure to provide, 277.
- location of brattices, curtains, doors, 445.
 - furnace for, 142, 150, 153, 157, 161.
- measurements of air currents with anemometer, 196, 206, 225, 238.
- methods of producing, 129, 156, 161, 196, 203, 234.
- mine manager duty as to cross cut to secure, 194, 219, 224, 233, 237, 446.
 - may order miners out of mine, on improper, 194, 224, 237.
- misdemeanor to open airways, 132, 146, 201.
- operation of fans, 447.
- operator's failure to furnish as proximate cause of injury, 278.
 - effect of miner's negligence on his recovery, 277.
 - willful violation of statute, 277.

VENTILATION—Continued.

- penalty for violating act, 129, 132, 133, 134, 157, 161, 202, 228.
- permanent doors to close automatically, 196, 206, 220, 233, 446.
- pressure gauge required, 447.
- produced by fans, 196, 206, 234.
- purpose of doors in mine, 278.
 - statute requiring door attendants, 290, 281, 445.
- record of measurement of air current, 196, 206, 224, 225, 237, 238.
- relation of provisions as to sanitary conditions, 277.
- removal of explosive gases, 446.
- required in all coal mines, 129, 132, 133, 156, 161, 196, 206, 219, 232.
- requirements as to, 142, 150, 152, 156, 161, 196, 206, 219, 224, 225, 232, 237, 238, 445.
 - doors, 278, 279, 280, 446.
- roadways sprinkled, 447.
 - to escapement shafts not to be obstructed, 194.
- rooms not to be opened in advance of the air currents, 197, 206, 219, 238, 446.
- safety lamps, use, 446.
- self-closing doors required, 106, 206, 220, 233, 446.
- separate air current to every one hundred men, 196, 206, 213, 232, 446.
- shafts in process of sinking, 214.
- shelter holes required at doorways, 196, 197, 203, 203.
- statutory requirement as to cross-cuts, meaning and intent, 251.
 - doors, 278, 279, 280.
- stoppings required to close cross-cut, 197, 206, 220, 233, 446.
- sufficiency of, 142, 150, 152, 156, 161, 196, 206, 219, 232, 446.
- trappers to be at principal doors, 196, 203, 206, 220, 233.
- unlawful for miner to interfere with, 226.
 - obstruct air current, 226.
 - to use furnace emitting smoke into shaft, 157, 161.
- use of doors in aid of, 278, 279, 280, 445.
 - lights, 446.
- violation of statute as to, proximate cause of injury, 311.
 - by operator as to, liability, 277.
 - requiring, operations enjoined, 228.
- willful violation of statute as to, question of fact, 179.

VICE PRINCIPAL.

- See also Coal-mine operator, Contributory negligence, Mine manager, Miners, Negligence.
- action for his own dereliction of duty not maintainable, 183.
- violation of statute, no recovery, 183.

W

WATER.

- See also Drainage of mines.
- draining from mine, 5.

WEIGHING COAL.

- See also Coal mine operator, Mine inspectors, Miners, Miners' wages, Mining statutes, Records.
- act making, contracts dispensing with invalid, unconstitutional, 389, 390, 392.
 - providing for weighing coal at mines validity, 386.
 - requiring weighing coal at mines valid, 386.
- acts relating to, 385, 393.
 - weight of coal, 385, 392, 393.
 - unconstitutional, 389, 390, 392.
- amendatory act, 388, 392, 393.
- application of act to coal mines, 386, 392, 393.
- at mines, 386.
- check weighman, duties, 386, 393.
- construction and purpose of statute, 387.
- duty of mine inspectors as to, 48, 49.
 - owner or operator to adjust scales, 48.
- miner may employ check weighman, 386, 388, 390, 393.
- penalty for fraudulent weights, 390.
 - obstructing requirements of act, 386.
- platform scales in lieu of track scales, 386.
- prosecution of owner or operator for failure to adjust scales, 48.
- record of to be kept, 388, 390, 393.
- scales inspected and tested, 48.
- test weights made by mine inspector, 49.
 - to remain in custody of mine inspector, 49.

WEIGHING COAL—Continued.

- track scales required, 386.
- weighing at mines, 385, 386, 389.
- weight as basis of wages, 387.
 - of bushel, 385.
 - coal as basis of wages, 386.

WIDOW.

- See also Actions, Damages, Miners, Mining operations, Workmen's compensation act, Wrongful death.
- action for death of husband if caused by violation of statute, 184.
- wrongful death of husband, 132, 146, 158.
- damages for death of husband limited, 158.
 - recoverable for death of husband, 132, 146, 158.
- recovery for death of husband by negligence of mine examiner, 255.
- right of action for death of husband, 184.
 - vested in, 132, 146, 158.

WOMEN.

- See also Coal-mine operator, Miners, Mining operations.
- employment in mines prohibited, 129, 132, 133, 134, 143, 148, 198, 206, 228.

WORKMEN'S COMPENSATION ACT.

- See also Assumption of risk, Coal-mine operator, Contributory negligence, Damages, Mining operations, Mining statutes.
- accidents, contents of report by employer, 417.
 - to be reported by employers, 400.
- acts elective and not mandatory, 431.
 - providing compensation for injuries, 394, 463, 418, 447.
- administered by Industrial Board, 411, 453, 454.
- age of children for compensation, 453.
- aggravation of existing ailment or disease, 435.
- agreement with injured employee presumed fraudulent, 400, 414.
- allowance of benefit, 397, 405.
- amendatory acts, 447, 459.
- amount of compensation deducted from judgment recovered, 462.
 - to be paid by employer, instances, 396, 406, 420, 448-453.
- annotations, 430.
- annual earning as basis for computing compensation, 397, 398, 409, 449, 459.
- appeal from decision of Industrial Board, 435, 436.
- application of act, 448.
 - to employers, 395, 404, 448.
 - mine operator, 395, 404, 419, 448.
 - to employers, condition on notice, 431, 448.
 - mining, and quarrying, 448, 460.
- arbitration and procedure under act, 434, 455.
 - duties of committee, 411, 425, 455.
 - in case of disagreement provided for, 399, 411, 425, 466.
- arbitrator's decision conclusive, 412, 427, 467.
- assumption of risk, defense abrogated, 447, 459.
 - when a defense, 431.
- attorney's fee for securing compensation recovery, 400, 458.
- automatic application of act, 460.
- basis of computation for compensation, 397, 398, 409, 449, 459.
- beneficiaries may not waive provisions of act, 400, 414.
- benefits from relief association not affected by act, 400, 416.
- blanks to be furnished by board, 411, 424.
- burial expenses, 450.
- certificate of filing, as prima facie proof, 448.
- children surviving, increased compensation, 453.
- classification for legislative purposes, 430.
- coal-mine operator may elect to accept benefits, 394, 463, 447, 460.
- common law right of action for damages not affected, 418.
- compensation adjusted under act of 1911, 463.
 - as measure of employer's liability, 396, 410, 464.
 - for accidental injuries, 394, 403.
 - disfigurement, 451.
 - injuries, 451-453.
 - in case of death, 396, 406, 420, 449, 452.
 - increased where incapacity increases, 401.

WORKMEN'S COMPENSATION ACT—Continued.

- compensation loss of different members, schedule, 407, 421, 451.
 - sight, 452.
 - not reduced by contributions, 396, 406, 419.
 - to be in excess of fifty per cent of wages, 409, 422, 440, 469.
 - paid in installments, 396, 406, 408, 420, 423, 450, 453.
 - partial incapacity, 451.
 - payable by employer to employee, 459.
 - in installments, 450, 453.
 - requirements as to paying or securing 415, 420, 468.
 - temporary total incapacity, 450.
 - to be paid by employer, 396, 398, 406, 419, 447, 459.
 - employees of contractor or subcontractor, 459.
- complete disability, compensation and period for payment, 396, 397, 406, 420, 451.
- constitutionality of act, 430.
- construction and application of, 431.
- contract of employee to pay premiums for insurance void, 401, 417.
- contributory negligence of miner, effect on recovery, 434, 448.
 - defense of abrogated, 462.
 - when a defense, 431.
- creation of industrial board, 410, 424, 453, 461.
- damages recovered by third person deducted from compensation, 401, 417, 463.
- death as result of injuries, compensation, 449, 452.
 - compensation payable, 449.
 - extinguishes right to compensation, 409.
 - minimum sum payable, 397, 408, 422, 449.
- decision of arbitrator, filing with industrial board, 411, 425, 455.
 - industrial board conclusive, 412, 427, 457.
- defenses abrogated, 448, 462.
 - available to employer, 433.
 - unavailing to operator on failure to elect, 394, 404, 448, 462.
 - where employee elects not to accept, 431.
 - where employer elects to pay compensation, 431, 447, 448, 462.
- digest of decisions relating to, 430.
- disability, increase, review of proceedings, 434, 435, 453.
 - of employee, periods for payment of compensation, 396, 406, 420, 451.
 - partial and permanent, 434, 435, 451-453.
- disagreement as to question of fact or law, settlement, 399, 411.
- distribution of compensation paid, 450, 451.
- duties and powers of industrial board, 458.
 - of industrial board, 453-459.
- earnings based on hours as a day's work, 398, 410.
- election by employee, condition, 432.
 - employer and employee, remedy and practice, 432.
 - effect on employees, 403, 447.
 - to pay compensation, 459.
 - to pay compensation, defenses, 431, 448, 462.
 - to accept, presumption, 432, 447.
- elective provisions, 394, 403, 447, 448.
- employees, acceptance assumed until notice of contrary, 394, 403.
 - application of act to, 406, 448, 460.
 - contract of employment, 460.
 - election not to accept, defenses, 431, 462.
 - notice of, 433.
 - limited to compensation provided for, 396, 405, 419.
 - may not compel employer to accept, 432.
 - waive provisions of act, 400, 414.
 - sue negligent third person, compensation abated, 401, 436.
 - withdraw from operation of act on notice, 403, 404.
 - meaning as used in act, 462, 405.
 - must give employer notice of injury, 400, 414.
 - notice of nonacceptance, 394, 403.
 - persisting in insanitary or injurious practices, effect, 460.
 - refusal to elect, defenses available to employer, 403.
 - submit to treatment, effect, 456.
 - right to common law or statutory action, 405.

WORKMEN'S COMPENSATION ACT—Continued.

- employer election not to accept, effect, 432, 447, 448.
 - presumed, 447.
 - financial ability to pay compensation, bond, 415, 429, 460, 462.
 - may withdraw without prejudice, 404, 460.
 - meaning as used in act, 402, 448, 461.
 - notice prior to expiration of year, 460.
 - not to withhold wages for insurance premiums, 401, 416.
 - knowledge of injury waives notice, 400.
 - required to give security, 462.
 - subrogated to rights of employee to recover from third person, 401, 416, 462.
 - to furnish security for payment of compensation, 461.
 - insure to cover liability, 462.
 - make provisions for payment of compensation, 462.
 - recover compensation paid contractor or subcontractor, 458.
 - report accidents to Bureau of Labor Statistics, 401, 402.
 - who shall constitute, 404, 448, 461.
- examination of injuries by medical experts, 399, 410, 423, 456.
- excess of judgment against negligent third person, payment to injured employee, 462.
- extrahazardous enterprises, 404, 419, 463.
- failure of employer to elect, defenses unavailing, 394, 404, 447, 448, 462.
 - comply, notice by industrial board, 460, 662.
 - provide security, effect, 461.
- refusal or willful neglect to obey act, 402, 418.
- fellow servant, defense of negligence of, abrogated, 448, 462.
- fixing amount of disability payment, 397, 409, 451.
- form of certificate of filing, 448.
- hearings before arbitrator, 411, 425, 455.
- increase of maximum compensation, 401, 453.
- industrial board, appointment of members, 453.
 - created, 410, 424, 453, 461.
 - orders and rules for carrying out duties, 411, 424, 454.
 - reports to governor, 414.
- injured employee must submit to examination, by surgeon, 398, 410, 423, 456.
 - persisting in insanitary or injurious practices, 412, 426, 456.
 - refusal to submit to medical treatment, 412, 426, 456.
- injuries, increased, application for increased compensation, 401.
 - schedule of compensation, 407, 421, 451.
- injury as proximate cause of incapacity, 435.
 - resulting from intention, no compensation, 398.
- insolvency of employer, right of injured employee, 401, 414, 428.
- insurance may be required of employer, 415, 429, 461.
 - not affected by act, 400, 416.
- jurisdiction of industrial board, 411, 454, 461.
- judgment against negligent third person, payment to employer, 462.
- legislature may require employer to pay compensation, 430.
- liability of employer to employees of contractor or subcontractor, 459.
- loss of eye, compensation, 452.
- loss of member, compensation, 407, 421, 451.
- lump-sum payments, 397, 409, 450.
 - procedure to obtain, 397, 409, 423.
- maximum compensation, 408, 422, 452.
 - increased, 453.
- minimum compensation increased, 450.
- minor's right to recover for injury, 433.
- negligence of third person, liability to employer, 463.
- notice of accident, contents, 400, 414.
 - time of giving, 400, 414.
- claim, 451.
- election and nonelection, filing with industrial board, 447, 448, 460.
 - method of giving, 460.
 - not to accept benefits posting, 394, 404.
- employee's election not to acceptance, 433.
- employer's election filed with industrial board, 460.
 - not to accept, 433.
 - refusal to accept, admissibility in evidence, 421.
- injury, sufficiency, 434.

WORKMEN'S COMPENSATION ACT—Continued.

- notice of nonelection by employee, 400.
 - of benefits of act, 404.
 - necessary, 447.
 - withdrawal required, 404, 400.
 - to employer of employee's nonelection, 400.
- operator's election presumed, 394, 404, 447.
- partial incapacity, compensation, 451.
- penalty for failure to obey act, 402, 418.
- pension, payment per month, 452.
- periods for payment of compensation for disability, 396, 406, 420, 453.
- permanent disability, compensation, 396, 406, 422, 452.
 - disfigurement, compensation, 396, 406, 420, 451.
- personnel of industrial board, 410, 424, 453, 461.
- persons entitled to protection of act, 402.
- presumption as to election to accept, 432, 447.
- physical examination may be demanded by employer, 396, 410, 422, 456.
- physician appointed by industrial board, 412, 426, 456.
- powers of industrial board, 453, 457.
- preference of claim against property of employer, 396.
- presumption of employer's election, 394, 404, 447.
 - nonelection, 448.
- procedure before Circuit Court, 413, 427, 428, 454, 457.
 - industrial board, 424, 453-457.
 - for obtaining increased compensation, 401, 455.
 - review, 412, 426, 435, 456.
 - paying or securing compensation, 415, 429, 461, 462.
 - under act, 434.
- proceedings for compensation not begun until notice to employer, 400, 414, 451.
- process served under directions of board, 411, 454.
- proof of operator's nonelection, 433.
- publications by industrial board, 414.
- record kept by industrial board, 411, 424.
- remedies where disabilities increase, 434, 435, 457.
- repeal of act of June 10, 1911, 463.
- report of accidents, contents, 417.
 - industrial board to governor, 414.
- review of proceedings, 412, 426, 435, 455-457.
 - by Circuit Court, 413, 427, 457.
- right to compensation extinguished by death, 400.
- salaries and terms of office of members of board, 410, 424, 443, 454.
- schedule of compensation for particular injuries, 407, 421, 451-453.
- security furnished by employer, approval by industrial board, 462.
- showing as to employer financial ability to pay compensation, 415, 429, 461, 462.
- temporary total incapacity, compensation, 451.
- terms of members of industrial board, 410, 424, 454.
- time for commencement of action, 463.
- total disability, compensation and period for payment, 396, 406, 408, 420, 422, 452.
- violations of act, penalty, 402.
- withdrawal notice, 447, 460.
- workmen—meaning, 448, 449.

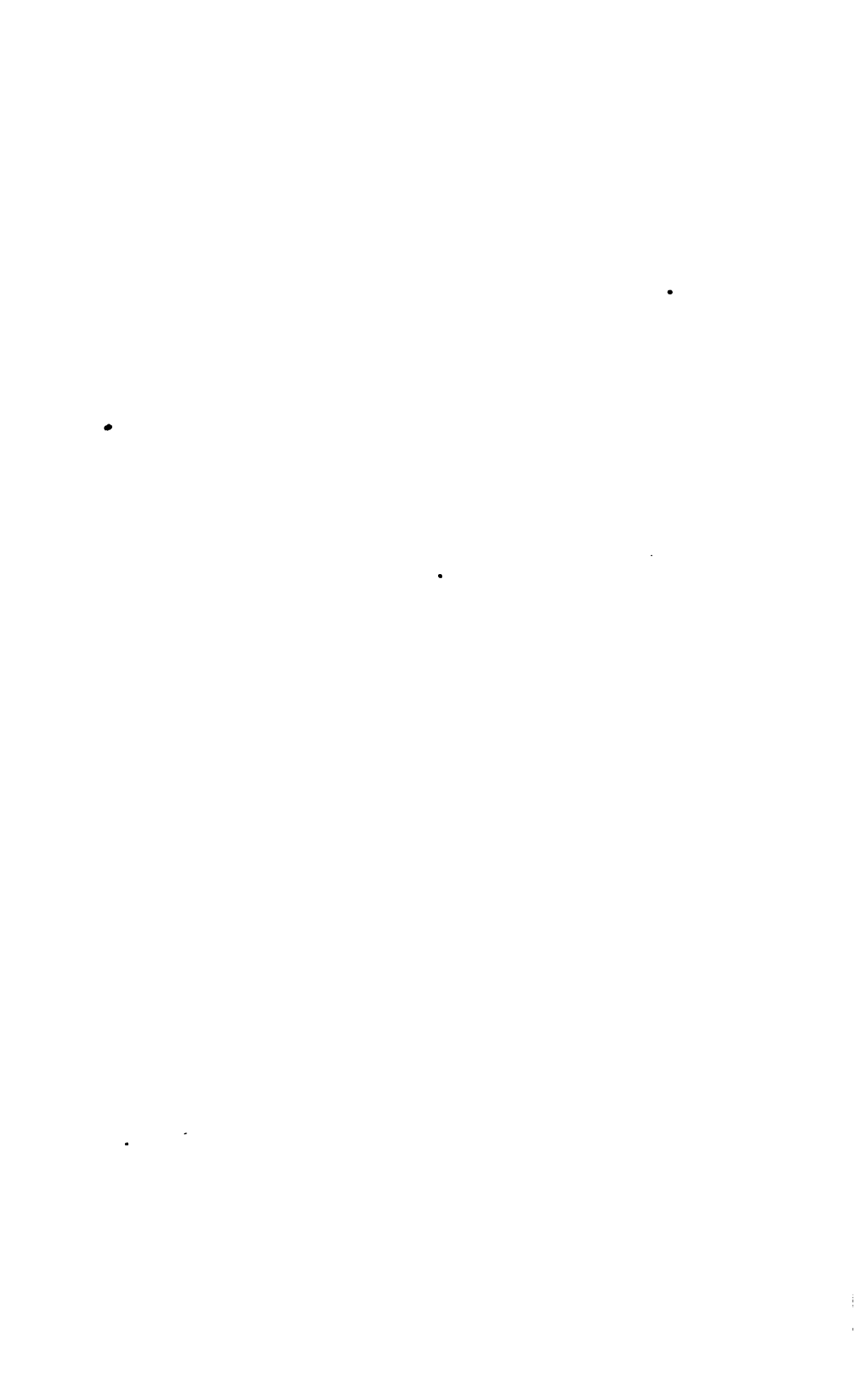
WRONGFUL DEATH.

- See also Actions, Coal-mine operator, Damages, Miners, Mining corporations, Mining operations, Proximate cause, Shot firers, Widow.
- accident due to mistake of inspector, liability, 140.
- action accrues to dependents, 184.
 - by next of kin, 184.
 - for by administrator, 140.
 - next of kin, 132, 146, 158.
 - widow, 132, 140, 146, 158.
 - death of shot-firer, proof and recovery, 379, 380.
 - parties, 323, 324.
 - right to sue, parties, 323, 325.
 - single recovery, 184.
 - who may sue, 184.

WRONGFUL DEATH—Continued.

- administrator's right of action, 184.
- application and construction of statute, 140.
- cause of action saved, 329, 330.
- change in statute as to parties, 327, 328.
- damages recoverable, 184.
 - distributed among beneficiaries, 186.
 - in single action, 184.
- dependents may sue for, 323, 324.
 - widow and children, 326, 327.
- elements considered in establishing damages, 325, 326.
- liability for failure to have mine inspected, 171.
 - of coal mine operator for, 132, 139, 146, 155.
- limitation of action for, 329.
- measure of damages, 325, 326.
- negligence of operator, liability, 255.
- nonresident dependent may sue, 323.
- parents may maintain action for, 323, 324.
- personal representatives to sue under act of 1911, 327, 328.
- pleading in action against operator for, 139.
- proof of dependence, 326, 327.
- right of action in widow, lineal heirs or adopted children, 184.
- single recovery of damages, 342.
- who may sue, 323, 324.
- widow may not sue if caused by negligence of operator, 184.
 - sue if caused by willful violation of statute, 184.
 - of deceased miner, right to sue, 184.
- right of action for, 184, 323, 324.
- who may sue for, 184.





DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, SECRETARY

BUREAU OF MINES

VAN. H. MANNING, DIRECTOR

**EXTINGUISHING AND PREVENTING
OIL AND GAS FIRES**

BY

C. P. BOWIE



**WASHINGTON
GOVERNMENT PRINTING OFFICE
1918**

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CONTENTS.

	Page.
Introduction.....	5
Acknowledgments.....	6
Causes of oil fires.....	6
Extinguishing fires in oil tanks.....	9
Steam smothering lines.....	10
Frothy-mixture system.....	10
Foaming solutions.....	10
Capacity of solution tanks.....	11
Pumps.....	12
Piping system.....	12
Foam mixing boxes.....	13
Foam slides.....	14
Preparing the solutions.....	14
Testing the solutions.....	14
Trying out the system.....	15
Care of system.....	15
Cost.....	15
Discussion of "frothy-mixture" systems.....	15
Foaming solutions.....	16
Solution tanks.....	16
Lime-water tank.....	17
Mixing tank.....	17
Protection for solution tanks.....	17
Pumps.....	17
Pipe lines.....	18
Mixing chambers.....	18
Foam slides.....	19
Agitating the solutions.....	19
Frothy-mixture systems in general.....	19
An oil fire extinguished by the frothy-mixture method.....	20
All-steel tanks.....	21
Extinguishing gas-well fires.....	22
Steam method.....	23
Water converted into steam.....	23
Hood method.....	24
Extinguishing oil-well fires.....	25
Methods used by C. P. Clayton.....	25
Method used on a fire at well in Texas.....	25
Method used at a fire at a well in Louisiana.....	27
Method used by M. E. Lombardi.....	29
Miscellaneous fire hazards and preventions.....	30
Hazards and precautions in and around garages.....	30
Hazards and precautions about tank farms and refineries.....	33
Tank construction.....	33
Pipe lines.....	34
Loading stations.....	34
Suction pipes.....	34
Levees.....	35
Lightning rods.....	35
Precautions about oil stills, etc.....	35
Run-down tanks, etc.....	35
Position of transformers.....	36
Smoking.....	36
Matches.....	36
Change rooms.....	36
Fire brigades.....	36
Water systems.....	37
Hazards and precautions about drilling and producing wells.....	37
Position of boilers.....	38
Lights for rigs.....	38
Lubrication of bearings.....	38
Static electricity.....	38
Shooting wells and blow-outs.....	39
Allowing drilling cable to slip through clamps.....	39
Precautions about wells where compressed air is used.....	39
Gas scrubbers.....	39

Miscellaneous fire hazards and preventions—Continued.	Page
Hazards and precautions, etc.—Continued.	
Accumulation of gas in ravines.....	40
Gas traps.....	40
Arrangement of valves for flowing wells.....	40
Matches.....	40
Insurance rates.....	41
Bibliography.....	41
Oil fire hazards and prevention.....	43
Publications on petroleum technology.....	46
Publications available for free distribution.....	46
Publications that may be obtained only through the Superintendent of Documents.....	47
Index.....	49

TABLE.

TABLE 1. Notable oil and gas fires in the United States during the 10 years, 1908 to 1917, inclusive.....	7
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ILLUSTRATIONS.

PLATE I. Number of oil and gas fires reported in the United States for 10 years, 1908-1917.....	4
II. Property losses in the United States from oil and gas fires, 1908-1917.....	5
III. A, Frothy-mixture pumping unit used at Coalinga, Cal.; B, frothy-mixture 5-inch cross-valve manifold used at Coalinga, Cal.....	10
IV. General arrangement of suction and discharge piping at pumps, frothy-mixture system.....	12
V. Six-inch cross valve with special seat and disk for acid-solution tank of frothy-mixture system.....	14
VI. Mixing box and foam slide, frothy-mixture system.....	16
VII. A, Mixing box of frothy-mixture system at Coalinga, Cal.; B, foam flowing into tank through hatchway, frothy-mixture system, Coalinga, Cal.....	18
VIII. Diagram showing layout of frothy-mixture system manually controlled.....	20
IX. A, Tank having mixing chamber made from cast-iron return bend; B, tank having mixing chamber made of sheet iron.....	22
X. A, Condition of foam on surface of oil after fire had been put out; B, Outside of tank after fire had been put out.....	23
XI. A, Arrangement of gas vents from "all steel" tanks; B, Explosion door for "all steel" tank.....	24
XII. A, Portable extinguisher for small gas fires; B, First stage in putting out gas fire with portable extinguisher.....	25
XIII. A, Second stage in putting out gas fire; B, Third stage.....	26
XIV. A, Fourth stage in putting out gas fire; B, Fifth stage.....	27
XV. Placing a hood made from a 36-inch stack over a burning gas well, first stage.....	28
XVI. Placing a hood made from 36-inch stack over a burning gas well, second stage.....	29
XVII. Extinguishing an oil-well fire by capping with a swedge nipple attached to 8-inch pipe.....	30
XVIII. A, Special 4-inch bit made from a case-hardened nipple; B, Safety matches and box, furnished by an oil company for use by employees.....	31
XIX. Condition of flowing oil well which had burned for 16 days after fire was extinguished.....	32
FIGURE 1. Arrangement for extinguishing an oil-well fire by forcing blaze into boiler stack, used by C. P. Clayton.....	26
2. Method of extinguishing oil-well fire by shutting off flow, used by C. P. Clayton.....	28
3. Method of extinguishing oil-well fire with mud-fluid.....	30
4. Arrangement of valves for flowing wells.....	41



NUMBER OF OIL AND GAS FIRES REPORTED IN THE UNITED STATES FOR 10 YEARS, 1908-1918, SHOWING NUMBER CAUSED BY LIGHTNING AND NUMBER FROM ALL OTHER CAUSES.



PROPERTY LOSSES IN THE UNITED STATES FROM OIL AND GAS FIRES, 1908-1917.

EXTINGUISHING AND PREVENTING OIL AND GAS FIRES.

By C. P. BOWIE.

INTRODUCTION.

During the period of 10 years from January 1, 1908, to January 1, 1918, approximately 12,850,000 barrels of oil and 5,024,506,000 cubic feet of gas were destroyed by fire in the United States, entailing a total estimated property loss of \$25,254,200. During this period 503 fires* were reported. As is shown in Plates I and II, 310 of these fires were caused by lightning and 193 by all other causes. The losses from the fires caused by lightning were estimated to be \$11, 148,000, and from those due to all other causes \$14,106,200. Directly and indirectly, the fires resulted in the deaths of nearly 150 persons and were responsible for almost as many more being permanently disabled.

For the past three years the Bureau of Mines has been conducting investigations to determine the nature and the specific causes of these fires, with a view to suggesting means whereby they may be successfully combatted and, in some places, perhaps eliminated entirely.

As the subject of oil and gas fires is necessarily broad, no attempt is made in this bulletin to treat it exhaustively; rather the bulletin aims to point out what has been done by operators in the past, and to describe various fire-prevention methods and fire-fighting apparatus which are being used or adopted by many of the larger oil companies. These methods and apparatus, it is believed, if universally employed by operators, will largely decrease the present enormous annual losses.

In the discussion of oil-well fires, the methods used in extinguishing several of the larger and more perplexing ones are described. As the right procedure for extinguishing any oil-well fire must be determined largely by local conditions, it is not probable that all of the methods used at some one fire, as described, will be applicable to a future fire. However, the operator, from these descriptions, may at least gain suggestions that will greatly assist him in fighting similar fires.

* Not including small gasoline fires.

ACKNOWLEDGMENTS.

The author wishes to express his appreciation for assistance in the preparation of this paper, by information given or by kindly criticism, to the following people:

C. P. Clayton, manager, and J. C. McCue, general superintendent, of the Producers Oil Co.; W. L. Wedger, chemist for the Massachusetts District Police; D. W. Moffitt, assistant general manager, and Walter Miller, superintendent of manufacturing, of Cosden Oil Co.; W. A. Williams, assistant general manager, J. J. Allinson, chief engineer, H. O. Ballard, field superintendent, and W. F. McMurray, drilling superintendent, of the Empire Fuel & Gas Co.; S. D. Hunter, oil operator, Shreveport, La.; A. W. Gunnison, surveyor of the San Francisco Board of Fire Underwriters; J. W. Tryon, manager of the Gulf Refining Co.; E. W. Clark, manager, and E. I. Dyer, manager of refineries, of the Union Oil Co.; N. W. Thompson, chief engineer of the Simplex Refining Co.; W. E. White, engineer, Associated Oil Co.; H. H. Beers, construction manager, and P. Engelbright, refining manager, of the Shell Oil Co.; G. B. Maloney, chief engineer of the Associated Pipe Line Co.; M. E. Lombardi, superintendent of construction, H. B. Truett, chief engineer, and P. A. Williams, field superintendent, of the fuel-oil department of the Southern Pacific Railway Co.; L. D. Dimm, refinery manager, H. M. Storey, secretary, and H. H. Hall, engineer, of the Standard Oil Co. of California; and from the Bureau of Mines; Miss E. H. Burroughs for the bibliography on oil fires; A. R. Elliott for the drawings; and Miss H. M. Lansche for clerical work.

CAUSES OF OIL FIRES.

Table 1 shows the losses from the more noteworthy fires at oil and gas wells during the 10-year period 1908 to 1917 inclusive. It is interesting to note that only 3 fires were reported in the Mid-Continent and the Gulf fields during January and only 6 in December for 10 years, whereas 75 were reported for June; and that during June 73 out of 92, or nearly 80 per cent, of the total number of fires reported from all fields were caused by lightning.

TABLE 1.—Noteworthy oil and gas fires in the United States during the 10 years, 1908 to 1917, inclusive.^b

	Number of fires reported.	Location.		Causes.		Estimated loss.		Estimated property losses.		Total.
		Mid-Continent and Gulf fields.	Other districts.	Lightning.	Other causes.	Oil, barrels.	Gas, cubic feet.	By lightning.	By other causes.	
January.....	8	3	5	.....	8	62,000	950,000,000	.....	362,500	362,500
February.....	23	15	8	10	13	233,000	380,500,000	114,700	805,200	979,900
March.....	33	26	7	14	19	357,200	.....	124,900	443,550	568,350
April.....	32	25	7	22	10	610,350	.....	614,200	368,000	832,200
May.....	46	39	7	31	15	1,614,000	.....	1,051,700	1,372,000	2,423,700
June.....	92	75	17	73	19	2,334,500	800,500,000	2,741,220	3,617,200	6,314,780
July.....	73	49	23	45	27	2,580,600	147,005,000	2,138,330	3,676,450	5,814,780
August.....	80	71	9	69	11	3,262,400	550,000,000	3,096,000	1,030,500	4,126,500
September.....	44	35	9	32	12	683,250	.....	781,060	1,374,000	2,155,060
October.....	31	17	14	12	19	535,400	.....	241,000	1,190,000	1,431,000
November.....	20	13	7	2	18	510,600	1,128,500,000	835,000	1,406,000	1,801,000
December.....	22	6	16	.....	23	55,200	20,000,000	.....	1,082,000	1,082,000
Total.....	503	374	129	310	193	12,849,500	5,024,505,000	11,148,000	14,106,200	25,254,200

^a Not including small gasoline fires.^b Data compiled from technical journals, personal inquiries, and other sources.

As the table shows, 374 out of 503, or 74.3 per cent, of the fires were in the Mid-Continent and Gulf fields; 310, or 61.8 per cent, of the fires were caused by lightning, and the property losses caused by lightning were 44.1 per cent of the total losses.

Oil and gas fires caused by lightning have become so common, especially in parts of the Oklahoma and Texas fields, that many people are beginning to regard them as almost unavoidable evils. In one week during the summer of 1914, fires from lightning in the Healdton and Cushing fields of Oklahoma destroyed 86 tanks of oil ranging in size from 250 barrels to 55,000 barrels, numerous oil rigs with equipment, several field pumping stations, besides earthen reservoirs, etc., the resulting property loss being almost \$1,000,000. Hence it seems that in dealing with the agency that causes most of our oil and gas fires, and some of the most disastrous ones as well, we have to combat a cause about which comparatively little is known.

Another source of oil fires that has been brought to the attention of the writer and in some parts of this country, especially the New England States, has undoubtedly been the origin of a number of seemingly mysterious fires, is static electricity. Walter L. Wedger, chemist for the Massachusetts district police, in an unpublished report, dated November 24, 1915, to the chief of the Boston fire department cites these instances:

A chauffeur desiring to fill a large limousine, which was standing on the cement floor of a garage, took an ordinary 5-gallon can, having a wooden handle on the ball, and hung it by this wooden handle on the hook of a self-measuring gasoline pump connected with an underground tank in the yard outside.

He had drawn about 1 gallon when he heard a snapping noise and the can was in flames. The door of the garage happened to be open, and, grabbing the can around the lower part, he threw it on the concrete walk, where he turned the hose on it and finally extinguished the fire. As he had no other can and as this one was still intact he carefully washed it out, wiped it dry, and hung it again on the hook by the same wooden handle, which had only been charred. This time he had drawn about 2 gallons when the can fired again. He repeated the act of throwing the blazing mass out into the street and refused to use the can again.

Shortly after this incident another chauffeur in this same town started to fill his touring car which was standing on the floor of a private garage. The gasoline tank on the car was at the rear, and he used a 16-foot rubber hose connected with a gasoline pump at one end and having a metal nozzle at the other end.

The nozzle he held just above the filler hole of the tank, but not touching it, while another man did the pumping. Only a small quantity of gasoline had passed through the hose when a spark, which the chauffeur described as half an inch long, jumped from the nozzle to the tank and there was a fire.

At another garage an employee filled a 5-gallon can with gasoline from a pump and took it to the running board of a car. He had an ordinary metal funnel across which was stretched a piece of chamois skin, and, to make the funnel sit upright on the car tank, he had attached a thin piece of wood with a hole in it for the funnel spout. He stood on the running board and held the

pouring can quite near the edge of the funnel, but not touching it, when he saw a spark jump from the funnel to the can. It ignited the gasoline vapor, but by the quick action of extinguishers the car was saved.

The explanation of the first fire cited is that the friction of the flowing gasoline against the bottom and sides of the can generated electricity that charged the can. When the potential in the can became too great, the electricity jumped across the space between the metal of the bail and the pump, the can being insulated from the pump by the wooden handle on the bail. A spark was caused that ignited the vapor arising from the gasoline. Had the metal part of the bail been in contact with the pump nozzle, then there would have been a perfect conductor between the can and the pump, and the electricity would have passed from the can to the pump without causing a spark.

In the second fire cited, the gasoline flowing through the rubber hose generated electricity, part of which was stored in the metal nozzle on the outlet end. When the potential in the nozzle became too high the electricity was discharged into the gasoline tank, and as the nozzle and the tank were not in contact, a spark was formed. Had the nozzle been against the metal lip of the opening into the tank there would have been no spark.

The explanation of the last fire cited is practically the same. The board at the base of the funnel, being a nonconductor of electricity, insulated the funnel from the gasoline tank. The electricity generated by the friction of the gasoline flowing through the chamois skin was stored in the funnel, and when the can containing the gasoline was brought close enough to it the electricity was discharged into the can with the formation of a spark.

Besides lightning and frictional electricity there are, of course, innumerable other possible causes of oil and gas fires. However, these can be put under the general head of carelessness and will be discussed in the summary of this bulletin.

EXTINGUISHING FIRES IN OIL TANKS.

Water, the most common extinguishing agent, puts out a fire by cooling the flaming mass below the burning point; also the water coming in contact with the burning material tends to form a blanket of steam that shuts out the oxygen of the air, and "smothers" the fire. However, as water is not miscible with oil, it is rather unsatisfactory for extinguishing most oil fires. If the quantity of oil is small, the fire may be extinguished by the cooling effect of large quantities of water sprayed upon it, but if the body of oil is large, the application of water forms a serious menace, as the burning oil floats on it and may be carried to considerable distances, spreading the fire to adjoining buildings or other structures.

STEAM SMOTHERING LINES.

Hence the common practice is to keep water away from burning oil tanks and to fight the fire with steam fed into the top of the tank through small pipe lines 2 or 3 inches in diameter. The function of the steam is to fill that part of the tank above the oil and thus exclude air from it. Although this system has been successfully used in extinguishing numerous tank fires the writer believes that it should not be relied on as a sufficient means for overcoming such fires. If a tank has a wooden roof the steam may repeatedly extinguish the fire, and the latter may be as often reignited by embers falling from the roof; even if a tank has a steel roof, on steel roof supports, an explosion of the gases above the oil in the tank may rupture the roof, as often happens, and the steam may escape through this hole and prove wholly ineffective.

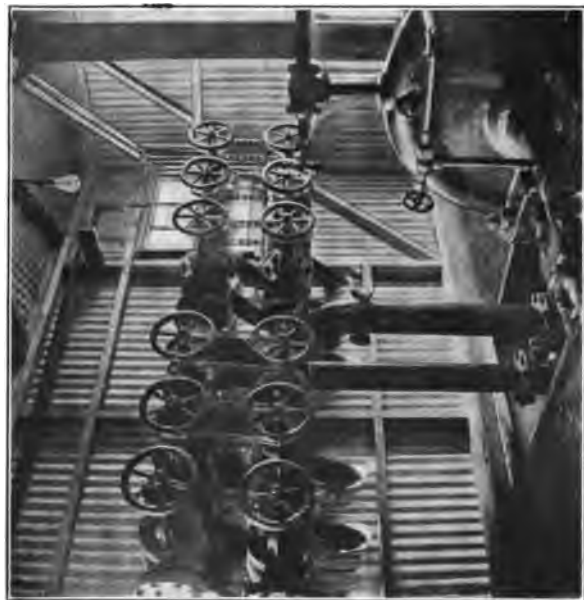
FROTHY-MIXTURE SYSTEM.

To overcome this defect in the application of steam a so-called frothy-mixture system of fire fighting has been devised, and is now being installed by many of the larger oil companies. As the writer believes that this system is to play an important part in reducing the number of future oil fires, a complete installation put in by the Associated Pipe Line Co., at Coalinga, Cal., is described here in detail, and the most important parts of the system are discussed in an endeavor to point out weaknesses and suggest improvements for future installations.

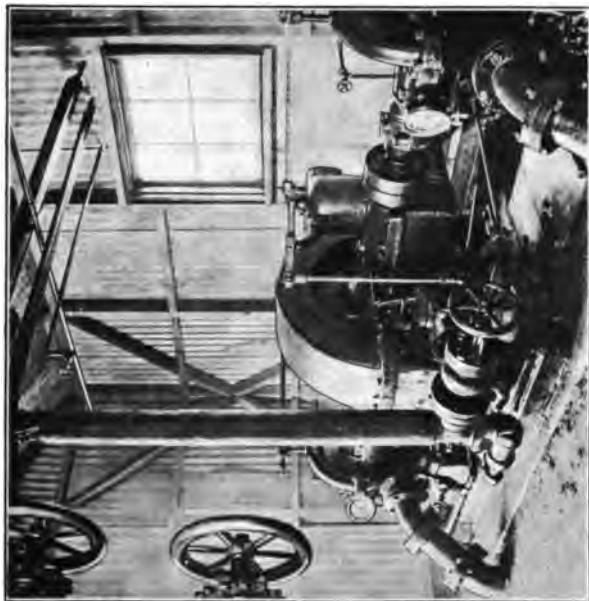
Essentially this system of fighting oil fires provides for bringing together two chemical solutions and for spreading over the surface of burning oil the thick tenacious foam resulting from their combination, thereby excluding air and extinguishing the flame. The apparatus required in practice comprises in brief two tanks—one for each chemical solution—a suitable pump, pipe lines to carry the solutions to the oil tanks or reservoirs, mixing chambers where the chemicals can combine, and a means for properly distributing the foam.

FOAMING SOLUTIONS.

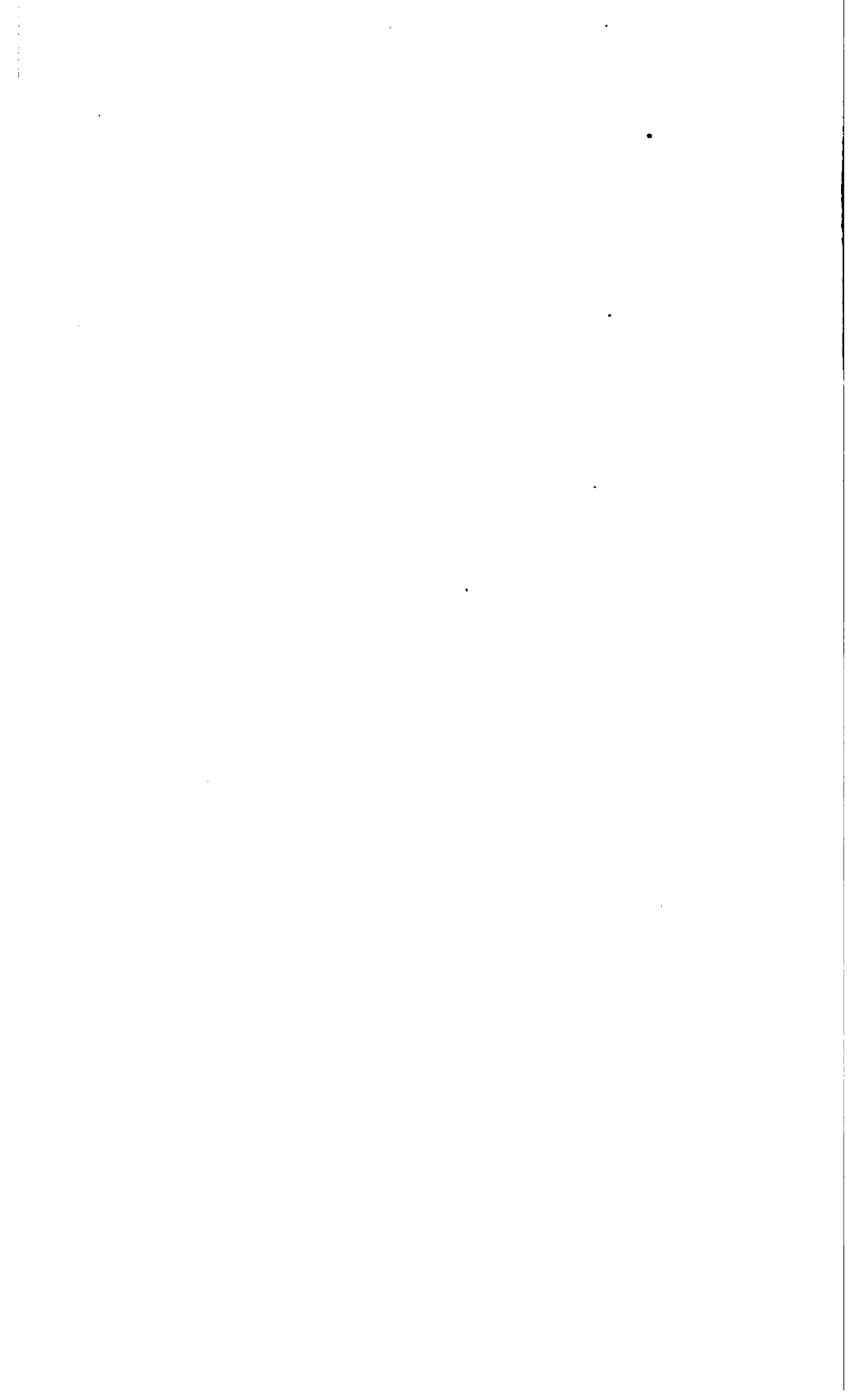
In general, the solutions for producing the foam may be any two compounds that on coming together form an abundance of relatively tough bubbles inflated with a noninflammable gas. The chemicals must be fairly cheap; also they must not deposit any appreciable amount of sediment after having been in solution for a considerable period of time. Usually the chemical constituents of each solution are so proportioned that when the two are combined in equal parts a maximum amount of foam is produced. The



4. FROTHY-MIXTURE PUMPING UNIT USED AT COALINGA,
CAL.



B. FROTHY-MIXTURE 5-INCH CROSS-VALVE MANIFOLD
USED AT COALINGA, CAL.



proportion of froth to solution should be about 6 or 8 to 1; that is, combining 50 c. c. of each solution should produce 600 to 800 c. c. of foam. In the installation at Coalinga the following formula was used:

Solutions used at Coalinga.

SOLUTION A.		SOLUTION B.	
	Parts by weight.		Parts by weight.
Water	100	Water	100
Aluminum sulphate (crystal)	10	Ground glue	1½
Sulphuric acid, 66° B.	½	Glucose	½
		Sodium bicarbonate	7½
		Arsenious oxide	¼

CAPACITY OF SOLUTION TANKS.

The installation was designed to protect four 55,000-barrel oil tanks each 114 feet 6 inches in diameter, one 37,000-barrel tank 95 feet 6 inches in diameter, one 30,000-barrel tank 86 feet in diameter, and two fuel-oil tanks each about 8 feet in diameter. On an estimate of 6 gallons of foam for 1 gallon of solution, to produce over the surface of all the various tanks a blanket of foam 5 inches thick in 5 minutes required the delivery of each solution at the following rates:

Solution required for each tank.

	Gallons a minute.
55,000-barrel tank	550
37,000-barrel tank	368
30,000-barrel tank	308
Fuel-oil tanks, about	6

On this basis 6,200 gallons of each solution would be needed to cover all the tanks once with 5 inches of foam. In order to provide an ample supply of solution and to allow a reasonable factor of safety, it was determined to use solution tanks 15 feet in diameter by 11 feet 9 inches in height, each having a capacity of 15,700 gallons.

The tanks were made from No. 10 U. S. gage galvanized iron, all seams riveted and soldered. A 6-inch suction outlet was placed on the side of each tank 3 inches from the bottom. The tank for solution B—the soda solution—had also a 3-inch drain on the bottom. The tank for solution A—the acid solution—was lined with sheet lead weighing 8 pounds per foot, and in lieu of a drain had in the bottom, immediately beneath the hatch, a depression made by riveting on a pan ½ inch deep and 12 inches in diameter. When the tank has to be emptied and cleaned, the liquid below the 6-inch side outlet can be removed with a steam ejector, or siphon, having its suc-

tion end placed in the pan. This method was considered cheaper and more satisfactory than using draw-off pipe, as such pipe would have to be of lead or lead lined.

The tops of the tanks were made of wood covered with roofing paper, the rafters being supported by the tank shell. The tanks were set on a platform made of 4-inch by 12-inch redwood planking laid on mudsills resting on an earthen grade built up about 3 feet above the pump foundation so that the solutions might flow to the pumps by gravity, even when the tanks were almost empty.

PUMPS.

For delivering the solutions to the various oil tanks two double-suction, single-stage, horizontal-shaft, centrifugal pumps are used directly connected to a 110-horsepower, impulse-type, steam turbine, the pumps and turbine being mounted on one bedplate. The pumping unit, shown in Plate III, was designed to deliver 550 gallons a minute against a head of 200 feet with a steam pressure of 140 pounds per square inch. The working parts of the soda-solution pump were of cast iron; the impeller and wearing rings of the acid-solution pump were of "acid bronze."

PIPING SYSTEM.

A separate system of piping controlled at the pump house, shown in Plate IV, carries each solution to its tank, each pump being so connected as to discharge into a manifold (Pl. III, *B*) composed of five 5-inch cross valves placed end to end. The soda-solution manifold is placed immediately above the acid-solution manifold, the corresponding valves to each system of piping being opposite each other. The stems of these valves are so connected with sprocket chains that the operator in opening the valve that permits the acid solution to flow to any given storage tank is opening, at the same time and at the same rate, a valve that admits soda solution to the same tank. This arrangement of sprocket wheels and chains is shown in Plate III, *A*. By this means the delivery of a proper proportion of each solution is insured whenever pumping starts. Each valve is plainly marked with the number of the oil tank to which it supplies solution, so that the operator has complete control of the entire piping system and can watch the pumps while remote from the fire.

The pipe used was ordinary merchantable galvanized-iron pipe 1 to 4 inches in diameter, depending on the required amount of liquid to be carried. The 1-inch pipe, which is taken off the ends of the manifold, serves the fuel tanks. Because of the relatively high proportion of alkaline salts in the soils at this station, all the pipes that

were buried were treated with a coat of refined asphaltum, wrapped with asbestos roofing paper, and then again coated with asphaltum before they were covered with earth. All lines are carefully laid on true gradients. At the low points are drains, so that after any part of the system has been used the solution remaining in any pipe can be drawn off and returned to its tank; the lines can then be flushed and the water drained off, leaving them empty when not in use.

The 6-inch suction nozzle from the acid tank is lead lined to the suction valve, about 8 inches from the tank. The valve itself, shown in Plate V, was specially constructed from a stock Crane 6-inch flanged cross valve by replacing the disk, seat, collar, and valve sleeve with fittings made of an acid-resisting metal that is about 5 parts antimony and 95 parts lead; hence when the valve is closed, as it is except when the system is in actual operation, all the parts that come in contact with the acid solution are acid-resisting. To guard against acid solution entering the iron piping if the valve leaks a $\frac{1}{2}$ -inch drain is provided in the bottom, which is kept open when the system is not in use. The water suction for flushing out the system is 3 inches in diameter and is connected to one run of the valve on the soda tank, as shown in Plate IV.

FOAM MIXING BOXES.

For each oil-storage tank there is a rectangular mixing box made of $\frac{1}{8}$ -inch steel plate into which the pipe lines leading to that tank discharge. Each box on the outside of the tank is supported by the shell and extends about 1 foot above the top angle iron, as shown in detail in Plate VI. Plate VII, *A* shows a mixing box and the solution lines leading into it. The object of having the boxes on the outside of the tanks is that if the tank roof should be wrecked by an explosion of gas at the outset of the fire, the boxes and piping would be unharmed and would still be able to deliver foam upon the blazing surface of the oil. The storage tanks have wooden roofs and the foam is admitted through a raised hatchway (see Pl. VII, *B*) built up about 2 feet above the original roof.

The boxes for the 55,000-barrel tanks are 4 feet 5 inches long by 2 feet 9 inches wide by 2 feet 10 inches deep, inside measurements. The upper 1 foot of the side toward the tank is cut away, and a lip 6 $\frac{1}{4}$ inches wide is riveted to the upper edge of this short side. This lip rests on top of the top angle iron of the tank. The notch, with the lip and a sheet-iron apron about 18 inches long, shown in Plate VI, form a wier and a flume through which the foam is delivered into the tank.

The boxes for the 37,000 and 30,000-barrel tanks are of similar construction, but of smaller dimensions. Those for the fuel-oil tanks are merely galvanized-iron pans about 14 inches square by 10 inches deep. The box is placed near the center of the tank and immediately beneath the roof, being supported by the solution pipes themselves.

The solutions enter the rectangular boxes on one side near the bottom and discharge into headers made of 6-inch pipe that has slotted perforations on the under side to mix the solutions thoroughly before being discharged over the wier into the tank.

FOAM SLIDES.

To insure the foam reaching the surface of the blazing oil at whatever depth it may stand in the tank, without the bubbles being destroyed by the impact of the drop, a series of baffles were designed. Their construction is shown in detail in Plate VI. The baffles are made of No. 10 U. S. gage black iron and are supported on 2 by 2 by $\frac{1}{4}$ inch angle irons which rests on a shoe at the bottom of the tank. These angle irons were each made in two lengths in order to facilitate their being placed in position, as the system was installed years after the tanks had been built. Each leg is fastened to the shell of the tank at a point about 10 feet from the bottom by a 2 by 2 by $\frac{3}{8}$ inch angle.

The foam pouring from the mixing box falls upon the uppermost baffle plate. The sticky character of the foam retards its descent, and it reaches the bottom of the tank, after having passed over the series of baffles at a velocity not much greater than when leaving the mixing box.

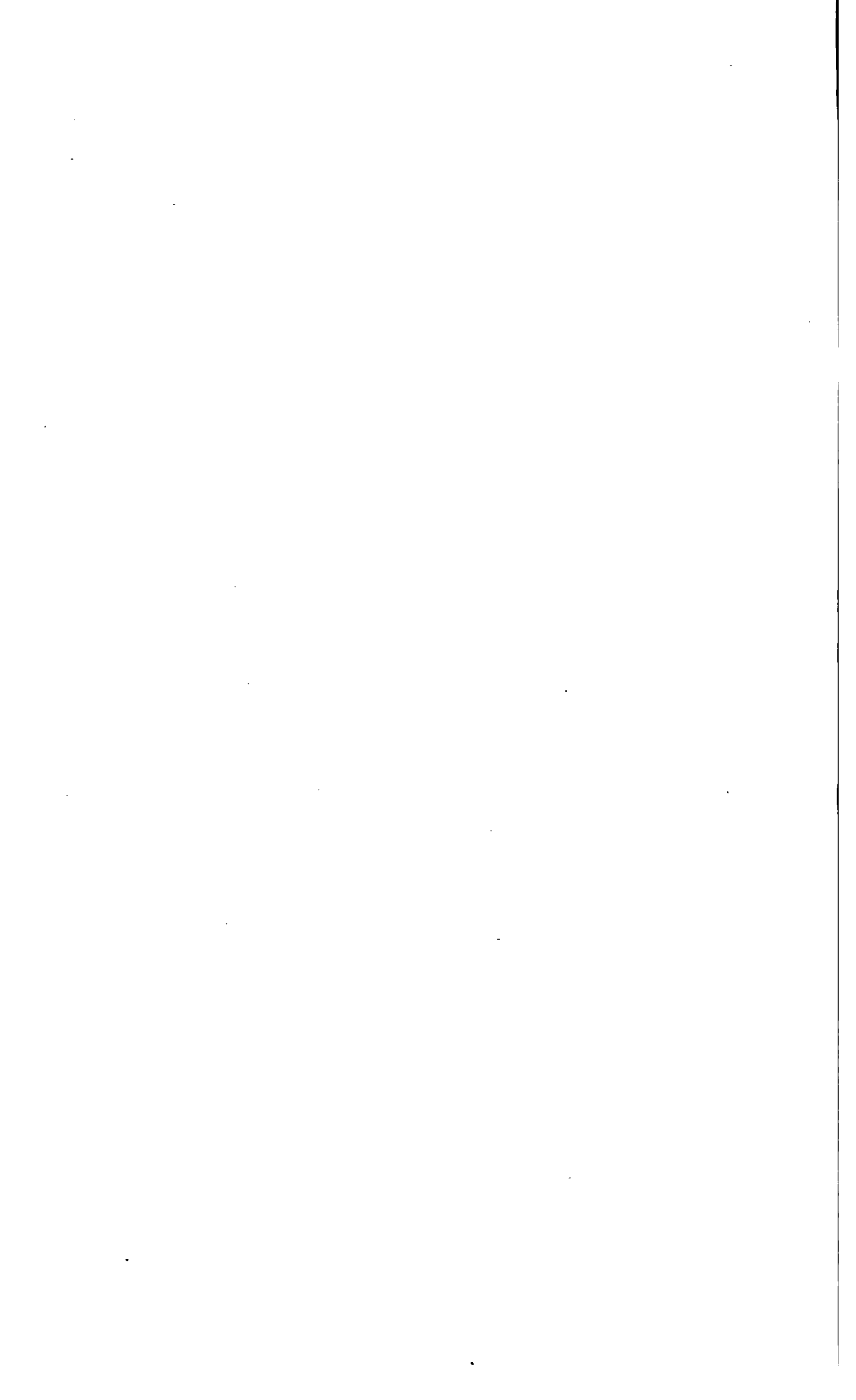
PREPARING THE SOLUTIONS.

In preparing the chemical compounds, each solution tank is filled with water to within about $2\frac{1}{2}$ feet of the top. In the acid solution tank the water is heated with a steam jet to a temperature of 180° F., and the aluminum sulphate and sulphuric acid added. While the chemicals are being added, the contents of the tank are thoroughly agitated with compressed air. In preparing the soda solution, the ground glue is first added slowly to the water before heat is applied, the liquid being constantly agitated with air; then the temperature is raised to 160° F., the glucose and the bicarbonate of soda are put in, and the mixture is agitated until all three are completely dissolved. The arsenious oxide is added last. Both tanks are then filled to the top with water and agitation continued until no undissolved chemical can be detected in the bottom of the tanks by stirring with a long pole.

TESTING THE SOLUTIONS.

The reagents, particularly the glue in the soda solution, slowly decompose so that it is necessary to add more from time to time.





For this reason the solutions are tested about once a month by mixing together 50 c. c. of each in a graduated beaker. If the volume of foam produced is less than 600 c. c., the necessary components to bring the solutions up to specification are added.

TRYING OUT THE SYSTEM.

No fires have occurred in the plant since the system was installed. However, it has been thoroughly tested out on several occasions. Foam can be delivered into the farthest 55,000-barrel tank, 470 feet from the pump house, in $1\frac{1}{2}$ minutes after the pumps are started, and four minutes later the entire surface of the oil will be covered with foam about 5 inches in depth. The foam is composed of minute bubbles and is so tough and durable that a considerable quantity will be found on the surface of the oil 24 hours after it has been spread.

CARE OF SYSTEM.

As it is absolutely essential that such a system be kept in first-class condition, thorough inspection is made once a week. Each part is examined and tested to make sure that it is ready for successful operation at a moment's notice. Steam is turned into the turbine, and the pumps are run for a few seconds, all valves are "cracked" and again closed to insure against the possibility of any valve being stuck at the crucial moment, and the mixing boxes are examined to see that they are clear of all objects that might impede the flow of foam.

COST.

The system was installed during 1914. Its cost complete, including turbine, pumps, piping, tanks, labor, etc., was approximately \$8,500, or a little less than 3 cents per barrel capacity of all the tanks protected. As this plant is an oil-pumping station, steam is always kept up, and it is not necessary to employ a man solely to operate the foam pumps. The cost of maintenance, therefore, is practically nothing, and the depreciation will be very small for a number of years to come.

DISCUSSION OF "FROTHY-MIXTURE" SYSTEMS.

The installation at Coalinga has been described in detail because it has many commendable features, especially where only a few tanks, not very far apart, are to be protected. The pump house is only a few feet from the boilers. The valves are all within a radius of a few feet, and by opening four valves (two at one operation) the solutions are started on their way to whatever tank desired. This system, if need be, can be operated by one man, and eliminates the

need of opening field valves, where there is always danger of a mistake, particularly at night.

FOAMING SOLUTIONS.

Beside the formula used at the Coalinga plant, given on page 11, the following have also been used:

Formulas for foaming solutions.

FORMULA 1.

SOLUTION A.		SOLUTION B.	
	Parts by weight.		Parts by weight.
Water-----	100	Water-----	100
Aluminum sulphate (crystal)---	14	Sodium bicarbonate-----	9½
Extract of licorice (powdered)---	3		

FORMULA 2.

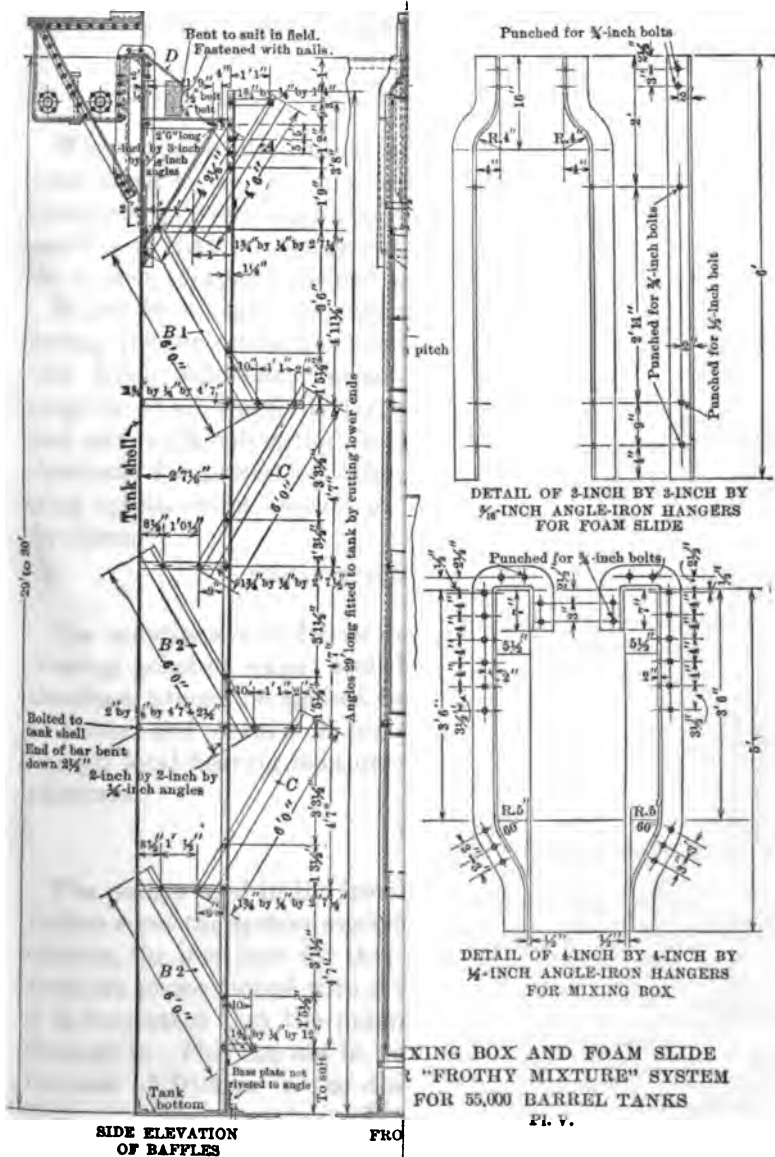
Water-----	100	Water-----	100
Aluminum sulphate (crystal)---	12	Sodium bicarbonate-----	10
Acetic acid-----	½	Ground glue-----	1
Ground glue-----	1	Glucose-----	½
Glucose-----	½		

Another formula that is being extensively used has for one of the components of the soda solution (solution B) a so-called secondary extract of licorice root. The licorice takes the place of the glue, and, so it is claimed, will remain in solution indefinitely and will not deteriorate with age.

SOLUTION TANKS.

The capacities of the solution tanks depend on the number of square feet of oil surface to be covered. On an estimation that 1 gallon of mixture (one-half gallon of each solution) will produce 7 gallons, or 1,617 cubic inches of foam, to cover the oil in a 55,000-barrel tank with 6 inches of foam would require about 2,800 gallons of each solution. To this figure, of course, a reasonable safety factor should be added. Where the number of oil tanks to be protected is small, as in the installation described, the size of the solution tanks can be figured with a reasonable degree of accuracy. However, where hundreds of oil tanks are involved, as in a large storage farm, the sizes of the solution tanks become a matter of judgment, for it is unreasonable to suppose that all of the oil tanks, or even a majority of them, would become ignited at the same time.

The sulphurous solution is a weak acid, and consequently will react on iron or steel. Hence the acid-solution tank must be made of wood or lined with some acid-resisting material, such as enamel or lead. In the judgment of the writer, lead is superior to enamel, because it is flexible, and settling of the tank or blows on the shell will



not crack a lead lining. However, lead is usually more expensive as to first cost.

LIME WATER TANK.

Some installations include a tank of about 2,000 gallons capacity, containing lime water for flushing the acid solution lines after use.

MIXING TANK.

Where the solution tanks are large, a fourth tank of about the same capacity as the lime tank is often installed for mixing the chemicals, as thorough mixing can be accomplished more easily in a small tank than in a large one. After one solution has been mixed, the tank is thorough cleaned and the other solution is mixed.

It has been suggested that if two such tanks are provided, each having proper connections to the solution tanks, there is no reason why fresh solutions can not be mixed, if need be, during the progress of an unusually large fire. This suggestion seems a pertinent one, as it solves the problem of providing an ample supply of chemicals for protecting large tank farms without the necessity of tying up an undue amount of capital in solutions and in containers for them. *

PROTECTION FOR SOLUTION TANKS.

The solutions will freeze at a temperature somewhat below the freezing point of water, probably at about 25° F. In cold climates, therefore, protection against freezing is necessary. The tanks should be housed and steam coils placed in the houses, but not in the tanks, as high local heating is injurious to the chemical components of the solutions.

PUMPS.

The pumps used in the installation described seemed to give satisfaction when the system was tried out, but they are not, in the writer's opinion, the best type for this kind of work. As the chemical solutions are proportioned with a view of using equal quantities of each, it is important that the pump accurately meter the liquid passing through it. This can not be done with centrifugal pumps. A slight increase of friction in the discharge line from one pump over the discharge from the other will be taken up by slippage in the pump, and unequal quantities of the solution will be delivered at the mixing box. This excess of one of the solutions is entirely wasted.

A duplex type of crank and flywheel pump, or a duplex power pump, using one cylinder for the acid solution and the other for soda,

are much better adapted to this service, as they will measure the quantities pumped quite accurately. Direct-acting, duplex, steam pumps are being used in some places; these are subject to the same defects, by reason of the short stroke, as the centrifugal pumps, although in less degree.

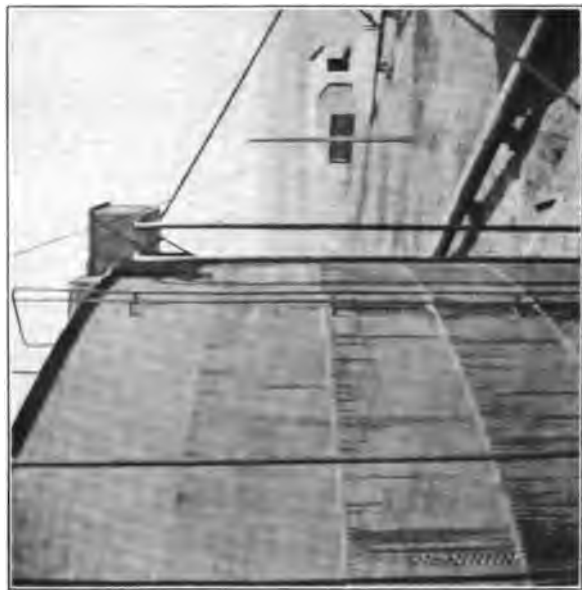
PIPE LINES.

The system of having separate piping for each tank, controlled at one central station, is in many ways an ideal one for installations of this character, but the cost will become prohibitive when a large number of tanks are to be protected. Where such is the condition, main headers of 4 to 6-inch pipe are run from the pump house to various parts of the tank farm, or refinery, and from these, at points opposite the respective tanks, smaller lines convey the solutions to the various mixing boxes, as illustrated in Plate VIII. All valves are kept closed when the system is not in use. When a fire starts, it is necessary to open field valves in the vicinity of the blazing tank before foam can be turned into it. However, these valves are, or should be, at a safe distance from all tanks, so that there can be no danger to an employee from opening them when the tank they supply is on fire. Also, any large tank farm or refinery should always have on the premises a number of trained fire fighters, who are familiar with the valves and the pipe lines. It is the practice of most companies to have the valves and the pipe lines—wherever they are above ground—carrying the solutions painted in different colors, as bright yellow and bright green, so that wherever a light can be thrown upon them they are at all times unmistakable. All tanks should be plainly numbered in large figures, with the corresponding numbers on the valves admitting the solutions to them. This is especially important where the valves are placed in clusters.

MIXING CHAMBERS.

The mixing chambers used are of various types. Plate IX, A, shows a type in use by a Texas company. This chamber consists of a cast-iron return bend with one leg longer than the other. The bend is hung over the top of the tank shell, and the solutions enter by separate pipes at the bottom of the longer leg, where they are mixed before being discharged into the tank.

Another type, shown in Plate IX, B, is made from light sheet iron, and is hung to the shell of the tank on the outside. The foam is admitted into the tank just below the top angle iron through a lip or nozzle about 8 inches long. The solutions enter the bottom of the chamber as in the type previously described. The tank shown was under construction and the foam pipes had not been installed.



4. MIXING BOX OF FROTHY-MIXTURE SYSTEM AT COALINGA, CAL.



B. FOAM FLOWING INTO TANK THROUGH HATCHWAY, FROTHY-MIXTURE SYSTEM, COALINGA, CAL.

Still another type is a standpipe about 12 inches in diameter placed inside the tank near the center and extending up to a point a little above the top angle iron. The solutions are admitted into the bottom of this pipe through the small pipes and are allowed to mix as they pass upward.

The essential points about the mixing chambers are: They should be so placed about the tank as to be reasonably immune from injury should the roof of the tank be wrecked by an explosion; they should be large enough to permit thorough mixing of the solutions before discharge; and they should be so constructed that at whatever height the oil stands in the tank there is no possibility of the discharge into the tank being so shut off that the foam can not enter freely. As to size, the boxes used on the 55,000-barrel tank in the installation described seem by actual trial to be amply large. When the different solutions are brought together the reaction is practically instantaneous, hence the boxes are probably larger than is necessary. However, this is an error on the side of safety; a slight excess in capacity can in no way be detrimental, and insures thorough mixing of the solutions.

FOAM SLIDES.

Foam slides have been omitted from all of the more recent installations, as experience has demonstrated that the bubbles are elastic enough to remain intact even though they are subjected to a sheer drop of 20 feet or more.

AGITATING THE SOLUTIONS.

In order to insure uniform and thorough mixing of the solutions at all times, each tank should be equipped with a means for agitating the liquids. This can best be done by running an air line down into the tank at the center, terminating in a side outlet cross resting on the bottom of the tank. In each horizontal arm should be placed a short piece of pipe. Air should be turned into this pipe about once a week, and the contents of the tank thoroughly agitated.

FROTHY-MIXTURE SYSTEMS IN GENERAL.

Aside from the manually operated systems several types of automatic systems are in use. However, as these all work on the same general principle as the one described, so far as the matter of extinguishing the fire is concerned, they will not be described at length. They depend on a fusible link, or plug, to start the flow of the foam, which is maintained either by gravity or by gas pressure. Automatic systems would probably prove highly satisfactory for small installations, where only two or three isolated tanks are to be protected, but

the cost of construction, as compared with manual control, becomes excessive where a large number of tanks are involved.

AN OIL FIRE EXTINGUISHED BY THE FROTHY-MIXTURE METHOD.

The following is an abstract from a report by Supt. J. W. Tryon, concerning a fire which occurred at the Gulf Refining Co.'s plant at Port Arthur, Tex., in the summer of 1916:

The installation at our Port Arthur refinery consists of four steam-operated foam-pumping stations, each equipped with duplex pumps built especially for the service, handling 367 gallons per minute of each solution and two tanks—one for each solution—of about 600 barrels capacity. The pump stations are so located that each one serves about the same area. After leaving the pumps, the solutions pass through 6 and 4 inch main header lines, which are tapped by 2-inch lines opposite the various tanks that convey the chemicals to the respective foam boxes.

The pumping plants are inspected daily by our fire marshal, and are at all times maintained in perfect working order ready for immediate operation. Immediately upon the approach of a storm, certain employees are detailed to go to the pump houses and start the pumps, which are equipped with by-passes relieving back into the tanks through pressure valves set at 85 or 90 pound pressure. This assures prompt operation, the only thing necessary being the opening of the valves on the main line, and on the branch lines leading to the particular tank where the foam is required.

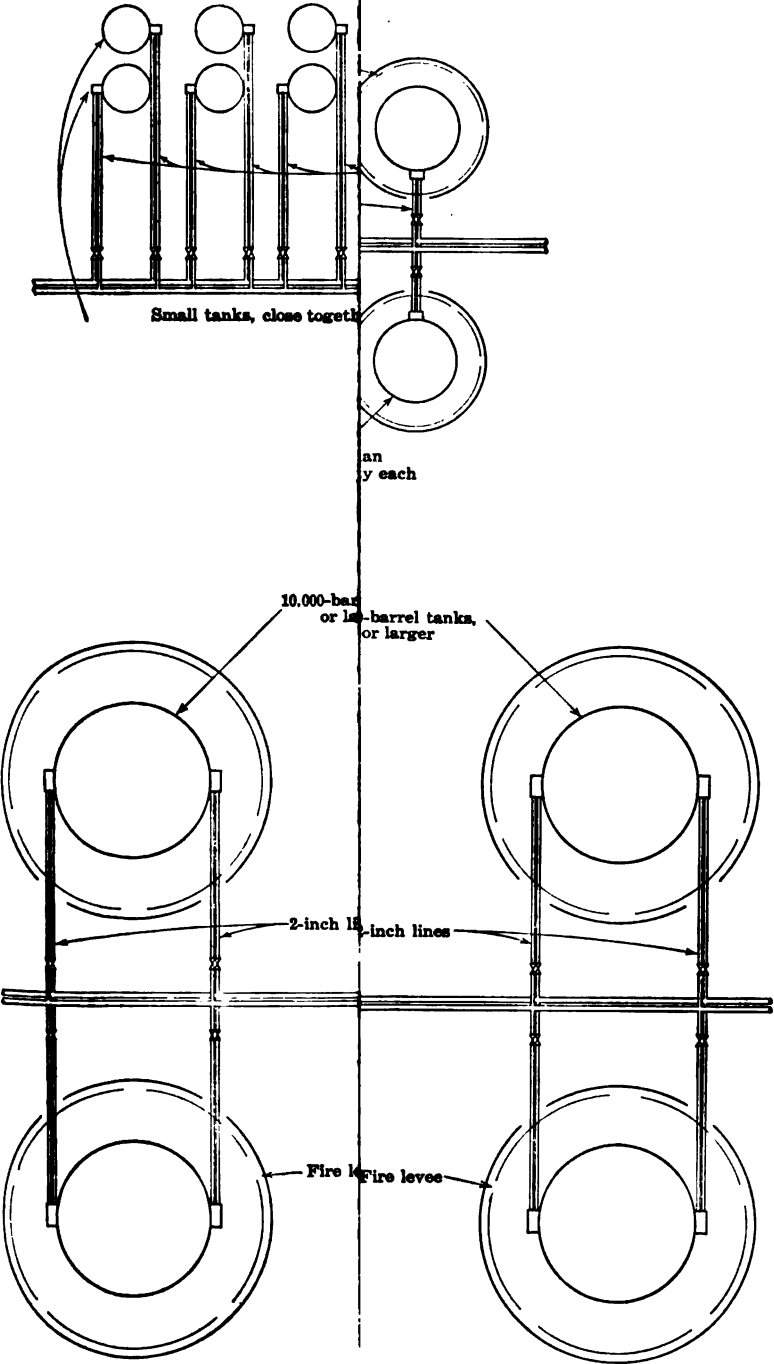
On the morning of July 19, 1916, there were indications of a storm, and the pump houses were manned as described. At 10.50 a. m. tanks Nos. 850, 855, and 857 were struck by lightning. No. 850 is 70 feet by 10 feet, having a capacity of 6,780 barrels. At the time it was struck it contained about 5,216 barrels of gasoline distillate. Tank 855 is 65 feet by 10 feet, with a capacity of 5,865 barrels, and contained 4,061 barrels of gasoline distillate. Tank 857 is 90 feet by 30 feet, having a capacity of 33,750 barrels, and contained 28,409 barrels of gasoline.

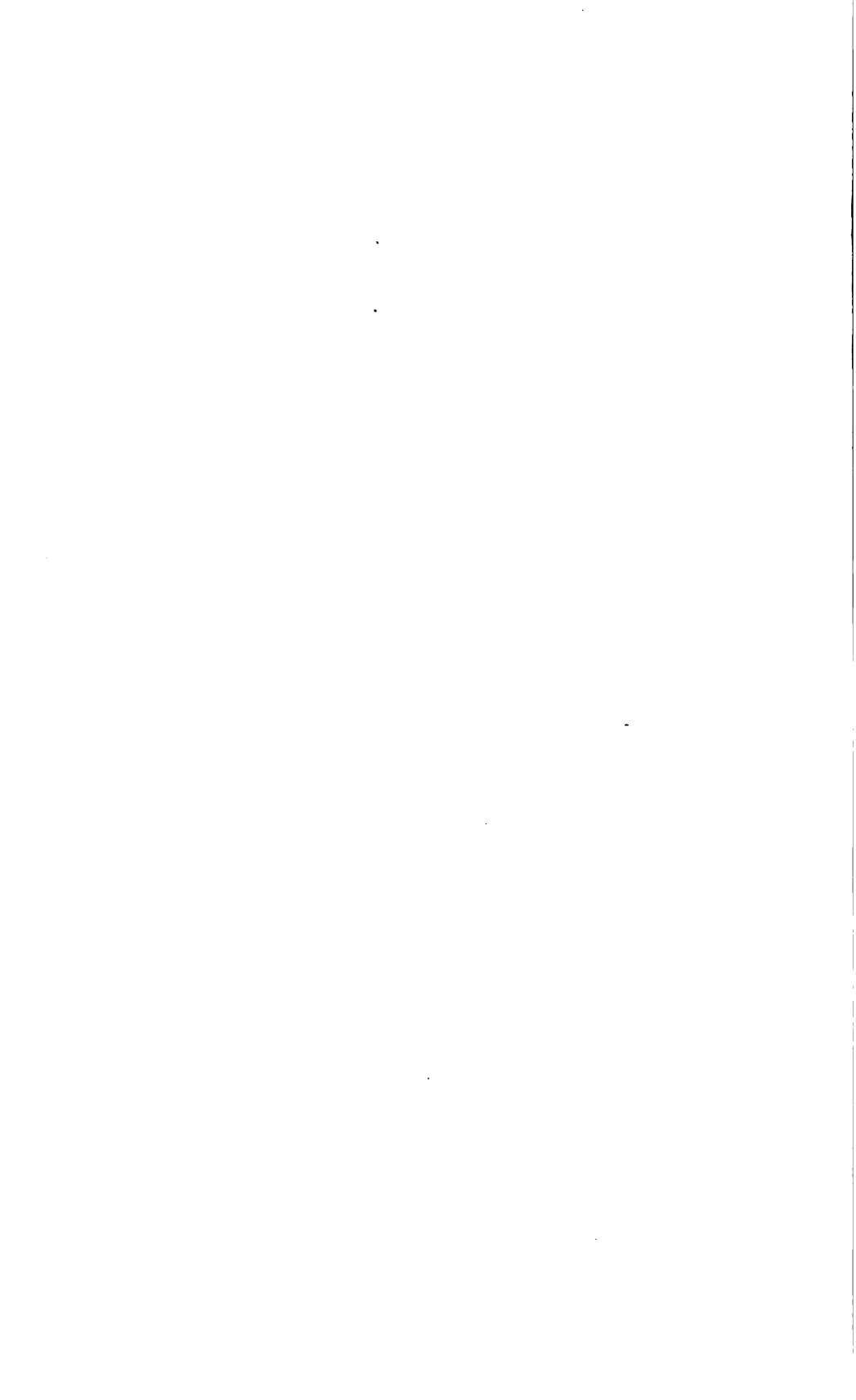
It is impossible to say whether all three of the tanks were ignited by the flash of lightning or whether No. 855 was struck and the fire communicated by it to the other tanks. An explosion occurred in No. 855, which blew the roof about eight feet into the air. In falling it broke in the center, and most of it settled beneath the contents of the tank; however, some of the wooden rafters extended over the edge.

The instant after the explosion the entire contents of tank No. 855 were blazing furiously. The roof of tank No. 850 appeared to be intact, but was burning all around the eaves. The roof of No. 857 was cocked up in several places and was burning fiercely.

Immediately after the tanks were struck the pumper opened the valves on the main lines, the fire marshal opened the valves to No. 857 and the foam was started into this tank. At 11 o'clock, 10 minutes after the fire started, there was no evidence of fire in tank No. 857. The foam was then started into 850 and 855, and the fires in both promptly extinguished—855 was entirely under control by 11.15 and 850 by 11.20.

The steps leading to tank No. 855 were not burned away, and an excellent opportunity was afforded to watch the action of the foam. Everything worked exactly as we had expected it to work. An excellent heavy foam poured





out from the mixing boxes in great volume, and within five minutes after starting it into tank 855 there was a blanket about 6 inches deep of it over the entire surface of the oil. This being the tank in which the explosion occurred, the flow of foam was somewhat impeded by the protruding rafters, but it gradually closed in and shut off the fire entirely. The fire in the rafters was put out by spraying water on them.

Plate X, *A* shows the condition of the foam on the surface of the oil after the fire had been extinguished and Plate X, *B* shows the outside of the tank and the wooden stairway, which was still intact. The report continues:

This was our first occasion for using foam on an actual fire. We desired to avoid the possibility of failure, and therefore proceeded very deliberately, and, no doubt, used considerably more foam than was necessary. I believe that if it should again become necessary to use this system we will be able to reduce the time required to extinguish a tank fire and that we will also be able to reduce very materially the quantity of solutions used.

Damage done by the fire was limited to two wooden roofs and some slight damage to the top rings of two of the tanks. Of the total contents of the three tanks, 37,686 barrels, there was a loss of but 191 barrels. Without the foam the minimum loss would probably have been 19,000 barrels, with a possibility of a very much larger loss. We believe this system to be an excellent practical solution of the problem of extinguishing tank fires if it is properly installed and operated.

ALL-STEEL TANKS.

The reader will notice that the tanks that Mr. Tryon has described had wooden roofs covered with roofing paper. So far as the writer is able to determine, all of the tanks that have been ignited by lightning in the past had wooden roofs covered with roofing paper, or sheet iron in bad condition, permitting the light hydrocarbon gases to pass freely between the sheets, so that at all times a stream of inflammable gases might be rising from all parts of the roof. Many of the oil operators believe that during a thunder storm it is not necessary that a tank should be actually struck by lightning for its contents to be set on fire. The writer has talked with numerous persons who claim that they have seen, after a flash of lightning, what they described as a "pillar of fire" extending above a tank just before the tank burst into flames.

In view of the fact that storm clouds in the Mid-West fields often sweep very low, and that several instances have been noted where ignited tanks have burned quietly without the roof or shell being disrupted, it is possible that the condition described is true. It is easy to conceive of atmospheric conditions being such that a storage tank with a leaky roof would be surrounded with a highly inflammable mixture of hydrocarbon gas and air, also that the gaseous stratum might extend a considerable distance from the tank, even communicating with bodies of similar gases from other storage tanks situated

at a considerable distance. Discharges of electricity from one part of a low sweeping cloud to another would serve to ignite the gas, and, all conditions being favorable, the fire would follow the stratum of gas, igniting the tank from which the gas issued, or perhaps a number of tanks.

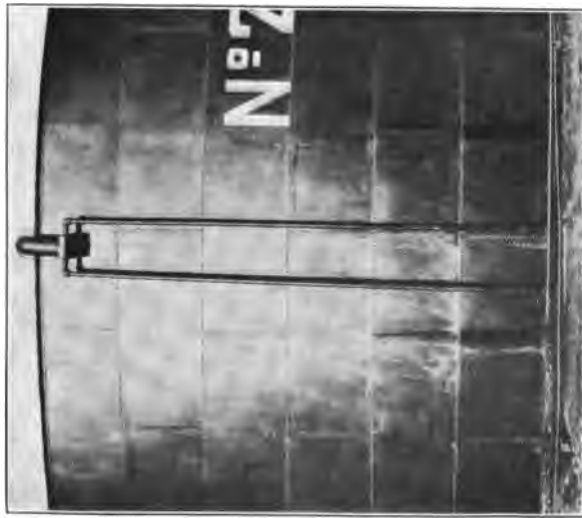
To overcome this condition, the Texas Co. at its storage farms along the Gulf of Mexico is constructing gas-tight all-steel tanks having one 12-inch vent (shown in Pl. XI, *A*) leading from the roof of the tank and terminating outside the fire levee in a standpipe about 10 feet high. On top of the standpipe is a tee having a plug screwed into one end and a short piece of pipe in the other; on the end of this pipe is a pair of flanges which hold a fine mesh wire gauze. The tank is fitted with four explosion doors, one of which is shown in detail in Plate XI, *B*. The roof of the tank being gas tight, all the gases arising from the oil are forced to pass out through the 12-inch pipe. Should the column of gases from this pipe be ignited by lightning, or by any other means, the fire would not pass through the wire gauze and could be extinguished by placing a blanket over the outlet of the pipe. If the flame should penetrate beyond the gauze into the tank, the explosion doors would relieve the pressure and on falling back into position would shut off the air and extinguish the fire. Up to the present time none of the tanks equipped in this manner have been struck by lightning. A decided improvement on this system would be to pass the gases discharged from the standpipes through a condenser, or absorber, or otherwise usefully dispose of them, thus eliminating the possibility of fire from vapors escaping into the atmosphere, besides saving the gases.

The writer believes that an all-steel tank equipped in this way, and having explosion doors and a proper "frothy-mixture" system if ignited by lightning or otherwise, could almost surely be saved with practically its entire contents. If it were not for the possibility of an explosion of gas disrupting the roof, steam would doubtless be as effective as foam.

Sometimes tanks without gas-tight roofs catch fire at the leaky places, such as the eaves, and burn for several moments before the oil itself bursts into flame. Such fires have been extinguished by smothering the blaze with blankets. However, this practice leads the fire fighters into great danger and should be condemned.

EXTINGUISHING GAS-WELL FIRES.

Fires at gas-wells, except at wells producing large volumes of gas, are, as a rule, not particularly difficult to overcome if the gas can be confined in one stream, because if the flow can be cut off for an instant the flame will be extinguished. Control of the gas flow, however,



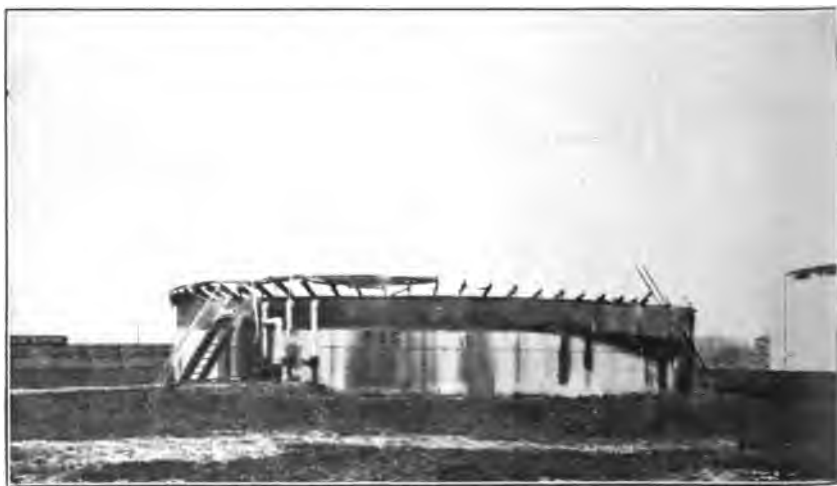
4. TANK HAVING MIXING CHAMBER MADE FROM CAST-IRON RETURN BEND.



B. TANK HAVING MIXING CHAMBER MADE OF SHEET IRON.



A. CONDITION OF FOAM ON SURFACE OF OIL AFTER FIRE HAD BEEN PUT OUT.



B. OUTSIDE OF TANK AFTER FIRE HAD BEEN PUT OUT.

Note the wooden stairway still intact.

is sometimes very difficult, as is shown ^a by a fire at a gas well of the Standard Oil Co. of California near Taft, Cal., in July, 1916. The well was making about 20,000,000 cubic feet of gas daily and was being brought under control at the time it caught fire. A gate valve had been placed on one of the strings of casing; gas was escaping through the gate valve and on the outside of this casing. The casing beneath the valve, owing to the heat of the fire and the weight of the valve, partly failed, permitting gas to escape laterally at high velocity through numerous cracks. The flame was then so large that it could not be smothered with steam. In order to bring the gas into one stream again, the casing was cut beneath the gate valve with a rifle, about 40 shots being required.

When the gas flow has been confined in one stream the flame, unless it is very small, will always be some distance above the casing. The greater the pressure on the gas the longer this column of unburned gas will be. If enough steam or water can be directed against this part of the gas column to interrupt the stream of ascending gases momentarily even the largest fire will be put out. As there are no particles of blazing fluid dropping from the flame, and as the casing head and the ground in the vicinity of the well will seldom be hot enough to reignite the gas, there is little danger of the flame being rekindled. However, it is a wise precaution to thoroughly spray the casing head and the ground adjacent to it with water just before the steam or water is turned onto the gas column.

STEAM METHOD.

In putting out gas-well fires with steam, the usual practice is to set up portable field boilers in the vicinity—sometimes as many as 20 are required—and surround the burning well with steam pipes. The pipes terminate in goosenecks having discharge ends so flattened as to throw a fan-shaped spray of steam against the gas column. The lines are usually screwed together at a safe distance from the well and pushed into position, or the men are protected from the heat by sheet-iron or asbestos shields, and water is continually sprayed on them as they work. When all is in readiness, steam is turned on from all boilers simultaneously. If the volume is sufficient, a blanket or cloud of steam will be formed and momentarily interrupt the gas stream just above the head of the casing, and the fire will be extinguished.

WATER CONVERTED INTO STEAM.

A method ^b used on a burning gas well near Monroe, La., in June, 1917, by William Guerin, formerly of the New York Fire Depart-

^a Editorial, Blaze of gasser out after five days' fire: Oil and Gas Jour., vol. 15, July, 1916, p. 32.

^b Manufacturers' Record, June 28, 1917.

ment, is worthy of note. The well was estimated to be making 40,000,000 cubic feet of gas daily. For the protection of the men two shields were pushed to within a few feet of the well. Two $\frac{1}{2}$ -inch jets of water under a pressure of about 40 pounds were so directed against the column of gas immediately above the casing that they converged from an angle of about 90 degrees. The nozzles were then slowly raised until the streams played on the base of the flame. Then the men handling the hose pressed their thumbs against the nozzles, making a fan-shaped spray. The spray, on striking the base of the flame, was rapidly converted into a cloud of steam which rose beneath the flame and put it out.

HOOD METHOD.

H. O. Ballard, of the Empire Gas & Fuel Co., has adapted the familiar snuffer principle to a portable extinguisher, which has been successfully used on small gas fires. This extinguisher is shown in Plate XII, *A*. The hood is mounted on wheels and terminates in a valve to which is attached a piece of 14-inch pipe about 20 feet long. The pipe can be extended to any desired length by screwing on more joints.

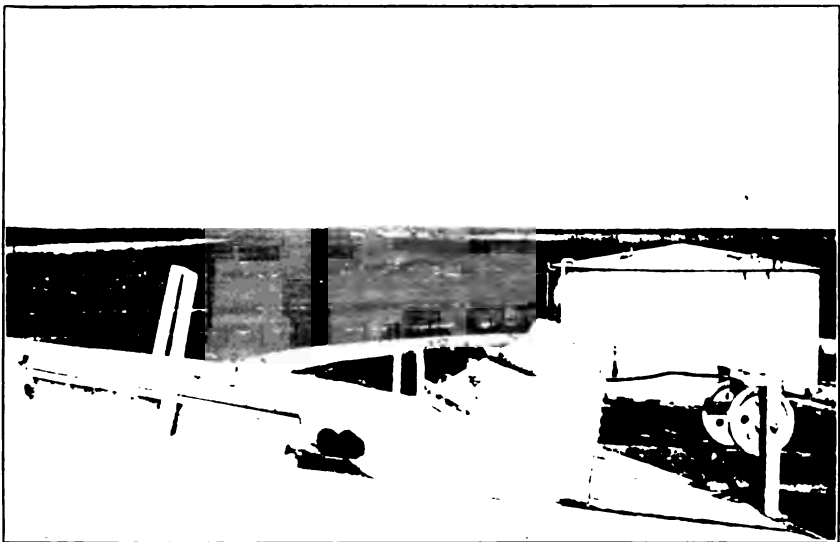
On either side of the hood, midway of its height, is a short piece of 10-inch pipe also containing a valve. The hood is taken to the site of the burning well. The desired extension is added to the 14-inch pipe, the large valve is opened, the two small valves closed. The hood is then upended over the fire by means of guy wires and block and tackle. The successive steps in this process are shown in Plates XII, *B*, XIII, *A*, XIII, *B*, XIV, *A*, and XIV, *B*. When the hood has reached the vertical position, if the fire is a small one, the lower valves are opened and the large one closed, thereby cutting off the flame. If the flow of gas is so strong that the discharge from the 10-inch pipes may reach the top of the stack and ignite before the large valve can be closed, the 10-inch pipes are extended to a safe distance from the well before the valves are manipulated.

This principle has also been successfully used with some very large gas fires. Max Moore, an oil operator of Tulsa, Okla., applied it in 1914 to a well which, after the fire was extinguished, was found to be producing at the rate of 500 barrels of oil and 40,000,000 cubic feet of gas daily. It so happened that the well was in a river bed, the banks being about 40 feet higher than the base of the derrick.

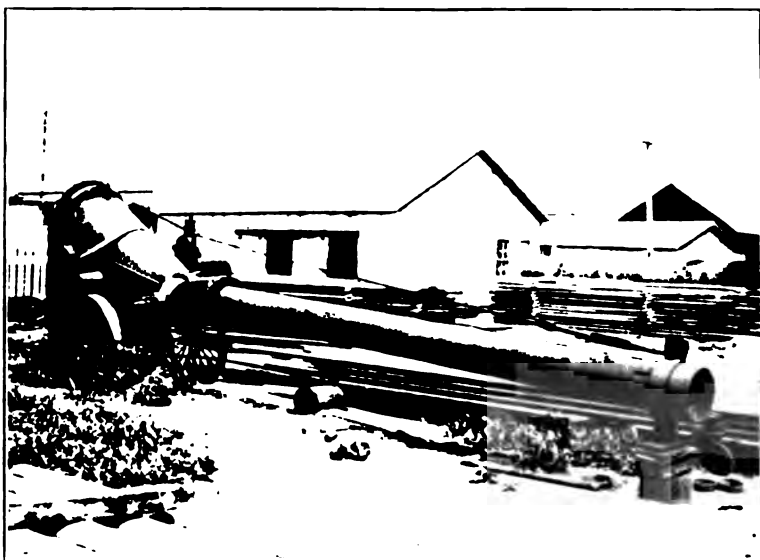
A wire cable was stretched from bank to bank in such a position as to pass just outside the stream of blazing gas. A hood made by riveting a funnel-shaped piece of pipe, the large diameter of which was about 5 feet, to an ordinary 36-inch smokestack, was hung from pulleys on the wire cable, drawn over the burning well, and placed



A. ARRANGEMENT OF GAS VENTS FROM "ALL STEEL" TANKS.



B. EXPLOSION DOOR FOR "ALL STEEL" TANK.



A. PORTABLE EXTINGUISHER FOR SMALL GAS FIRES.



B. FIRST STAGE IN PUTTING OUT GAS FIRE WITH PORTABLE EXTINGUISHER.

in position. Plate XV shows the stack nearing the fire, and Plate XVI shows it in position with the blazing column of gas issuing from the top.

The ground, rig irons, and the base of the hood were then thoroughly cooled by spraying with large quantities of water. The top of the stack was then drawn over at a considerable angle and the base was quickly removed from the well, thereby cutting off the supply of gas through the stack and extinguishing the fire.

EXTINGUISHING OIL-WELL FIRES.

Oil-well fires are often much more difficult to overcome than gas-well fires, because the well may be producing in such large quantities that the oil is not all consumed in one tapering flame, as with gas, but may flow away in a blazing mass for a considerable distance. Also, the burning oil soon heats the ground around the well so hot that no matter how often the fire may be extinguished it will immediately reignite.

Thus, no definite rules can be given for combatting fires at oil wells, as each burning well presents a problem of its own. The following descriptions of methods that have been successfully used are given, as has been stated, not with the belief that any one of these could be successfully applied to some other fire, although it might be, but with the hope that the ideas presented may, when used singly or in combination, be of service to operators in dealing with such fires in the future.

METHODS USED BY C. P. CLAYTON.

METHOD USED ON A FIRE AT A WELL IN TEXAS.

C. P. Clayton, superintendent of the Producers Oil Co., gives the following account^a of an oil-well fire in the Humble field, Texas, which was extinguished under his supervision in February, 1916.

The well had been flowing for two days and was making about 6,000 barrels daily. It was being brought under control at the time the fire occurred, and most of the oil was discharging through a 6-inch flow line extending about 20 feet from the head of the casing. Immediately over the well, about 6 feet above the derrick floor, oil was discharging through a 2-inch opening in a 4-inch tool joint at the rate of about 100 barrels per hour. The fire was caused by an electric spark in repairing a broken power line on the derrick floor.

The well was situated in a heavily timbered country, and, as a first precaution, all timber, stumps, and other inflammable material were removed from the vicinity. Twenty-nine portable field boilers were

^a See also Hazlett, A. J., Ingenious method used to extinguish burning gusher at Humble: Fuel Oil Journal, vol. 7, March, 1916, pp. 78-79.

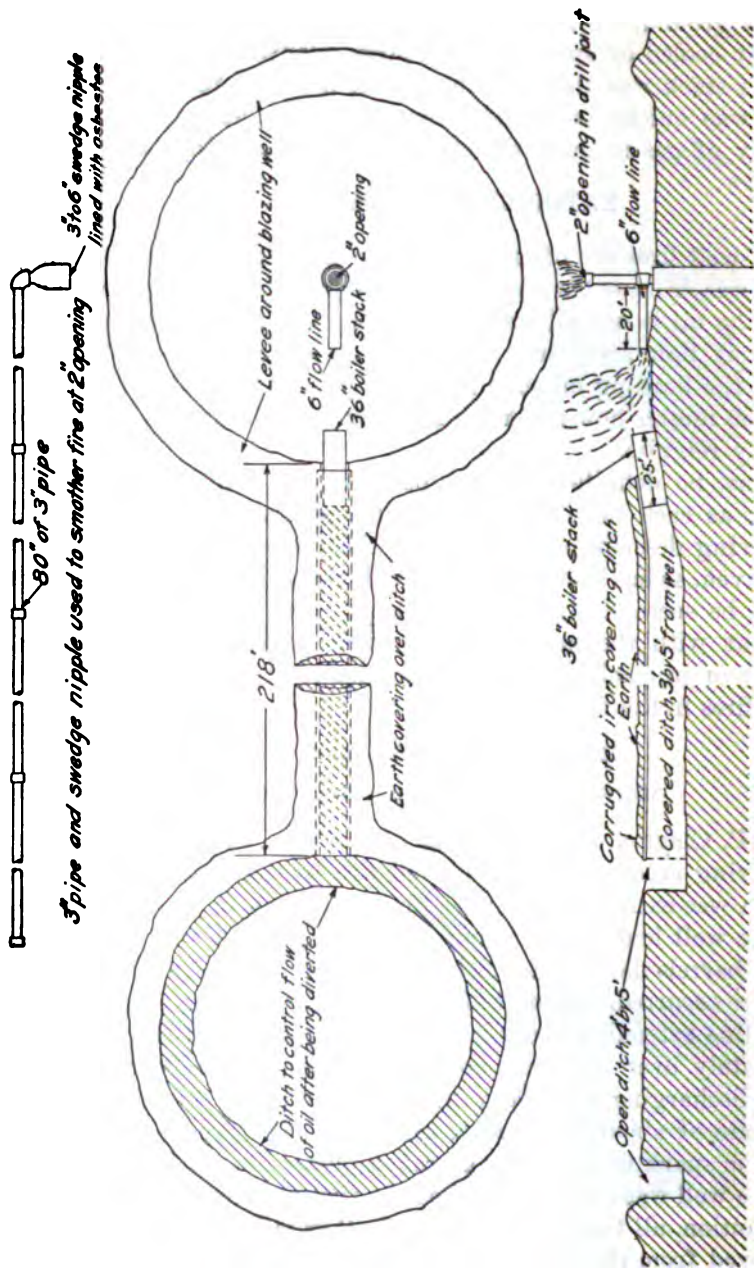
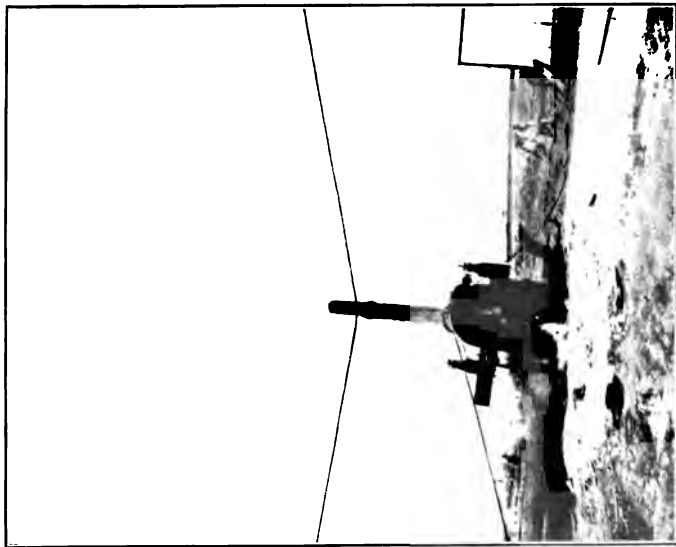


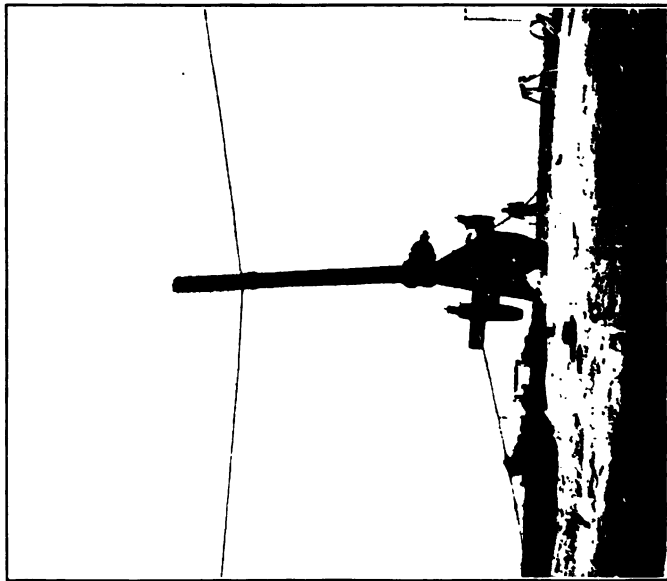
FIGURE 1.—Arrangement for extinguishing an oil-well fire by forcing blaze into a boiler stack, used by C. P. Clayton.



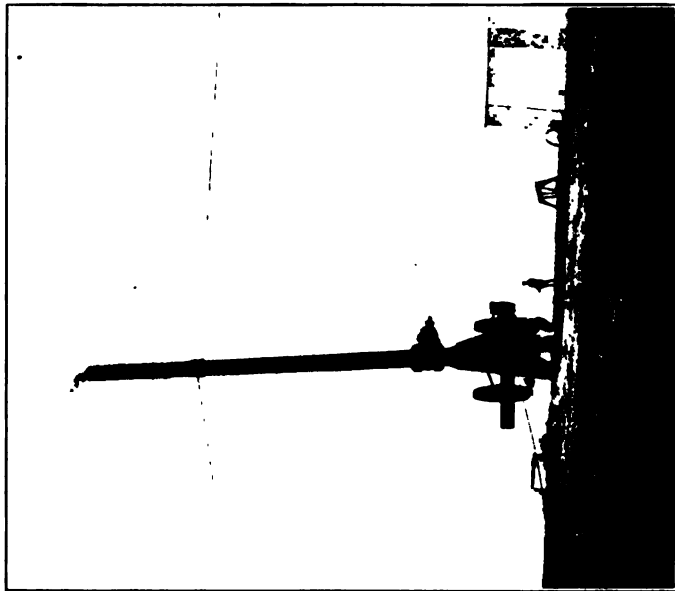
A. SECOND STAGE IN PUTTING OUT GAS FIRE.



B. THIRD STAGE.



4. FOURTH STAGE IN PUTTING OUT GAS FIRE.



5. FIFTH STAGE.

then set up, and a network of 4-inch and 2-inch steam lines laid about the well. Also, connections were made to seven boilers already installed at near-by drilling wells, and seven 2-inch water lines were laid. While this was being done a circular levee about 3 feet high was thrown up around the well, at a distance of about 50 feet from it. Opposite the flow line a ditch 218 feet long and 4 feet wide at the top, tapering to a depth of about 4 feet, was dug, which opened into a circular ditch of about the same depth and having for its outer circumference a radius of about 75 feet. This arrangement is shown graphically in figure 1. The straight ditch was then covered with corrugated iron, upon which was placed about 2 feet of earth. A piece of 36-inch smokestack was then placed in the mouth of this ditch and shoved up to within about 25 feet of the end of the flow line.

When all was in readiness, an asbestos-lined swedge nipple about 8 inches in diameter, attached to 80 feet of 3-inch pipe, was placed over the spray of burning oil discharging from the tool joint. This was done by men working from behind a corrugated iron shield, as shown in Plate XVII. At the second attempt this part of the fire was quenched and the oil discharging at this point, or the greater part of it, was made to flow through the 3-inch pipe. Immediately the steam and water was turned on the blaze at the end of the flow line (the men advancing behind shields) in such a manner as to drive the flame into the mouth of the 36-inch stack and extinguish it. The men protected their hands with gunny sacks and asbestos shields, and streams of water were continually sprayed upon them as they advanced. The preparatory work required about 17 hours; the actual quenching of the flames about 15 minutes.

METHOD USED AT A FIRE AT A WELL IN LOUISIANA.

Mr. Clayton also describes a method used by him to extinguish an oil-well fire in Caddo Parish, La., in 1911. This well burned 26 days, 2 hours and 10 minutes, and when the fire had been put out, a gage record showed a production of 48,000 barrels daily. The discharge was so great that the oil was not all consumed until some of it had flowed a distance of more than 100 feet from the well.

Thirty-six boilers were erected and the fire fought with steam for six days, but without success. At the end of this time this method was abandoned and a circular levee about 3 feet high and 200 feet in diameter was thrown up around the well, which formed a pond of blazing oil in which all the flow was consumed.

The well being on a hillside, a tunnel 4 by 6 feet by 328 feet long was driven (see fig. 2), striking the outer casing at a point 18 feet below the surface, measured to the center of the face of the tunnel. The well contained three strings of casing, 10-inch, 8-inch, and 6 inch. A split clamp was placed around the 10-inch casing, and to



PLACING A HOOD MADE FROM A 36-INCH STACK OVER A BURNING GAS WELL. FIRST STAGE.



PLACING HOOD MADE FROM 36-INCH STACK OVER A BURNING GAS WELL.
SECOND STAGE.

this was attached a string of 6-inch pipe extending beyond the mouth of the tunnel. An especially constructed 4-inch bit, shown in Plate XVIII, 4, was made from a case-hardened nipple. This bit had in one side a hole 2 inches square and was screwed onto the end of a string of 4-inch pipe; the joints of the pipe after being screwed tightly together, were also riveted. This string was placed inside the 6-inch pipe and was fitted on the outer end with a cap and a sprocket wheel to which was attached a rotary chain drive. A dead-man was set opposite the end of the pipe and a jack set between it and the cap.

The chain drive was then set in motion and a hole drilled through the casings. Careful measurements were kept on the jack as the 4-inch line advanced, so that the opening in the bit would be stopped as nearly as possible in the center of the 6-inch casing. When this point was reached, the bit was turned so that the hole was "looking" down into the well. A circulating pump was connected with the 4-inch pipe and asbestos shavings forced through it under a pressure of 1,200 pounds per square inch. After this had been done for a few minutes the pipe was so turned that the hole in the bit was on top and the flow of the well was shut off. The oil on the surface, inside the levee was soon consumed and the fire extinguished from lack of fuel.

In discussing this method, Mr. Clayton states that the tunnel, where it intersected the casing, was too near the surface. He thinks the distance should have been at least 30 feet, as several of the men in placing the split clamp were almost overcome by the heat and gas fumes. Also, the tunnel was too small. Had it been 6 feet by 6 feet instead of 4 feet by 6 feet the labor of driving it and of placing the 6-inch pipe would have been greatly facilitated and the time reduced.

METHOD USED BY M. E. LOMBARDI.

M. E. Lombardi, superintendent of construction of the fuel-oil department of the Southern Pacific Railroad, describes an oil fire extinguished under his direction which occurred in the Midway oil field, California, in 1913.

The well had been drilled by the rotary system and caught fire just after it had unexpectedly started flowing, so the rotary table was still in place. After the floor of the derrick had burned the table crumpled the end of the casing, which extended several feet above the ground, until the table rested on the ground. This formed a baffle and the oil spurted out laterally with such force that before long a crater about 50 feet wide by 40 feet deep was formed.

A large number of field boilers were set up near the well and the usual method of applying steam and water resorted to. The fire was repeatedly extinguished, but the sides of the crater had become so

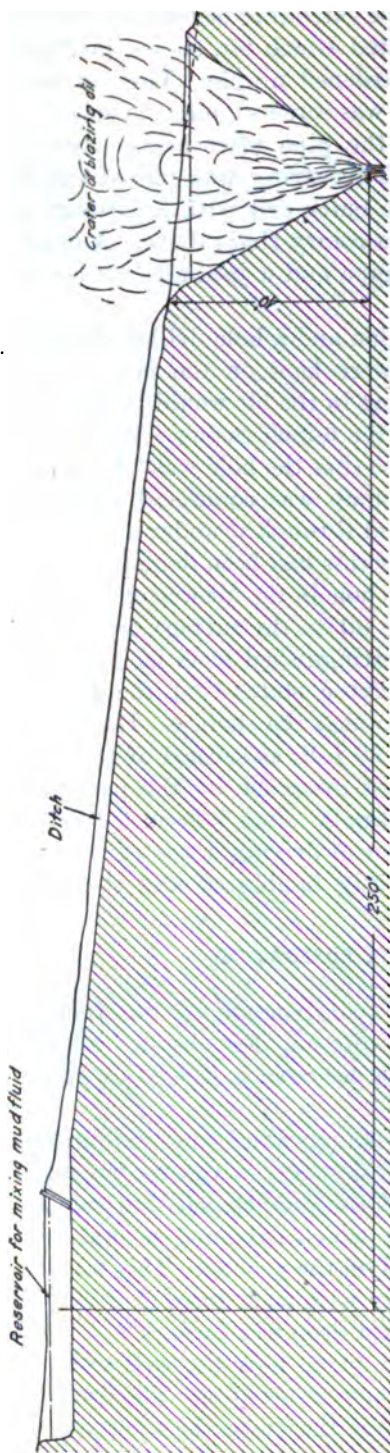


FIGURE 3.—Method of extinguishing oil-well fire with mud-fluid.

hot that the gas and the oil were reignited as soon as the blanket of steam lifted.

The well was on a hillside and the soil was a heavy clay. A pit about 50 feet in diameter and 3 feet deep was dug in the hillside about 200 feet from the well and about 30 feet above it.

In this pit mud was mixed, fluid enough to flow freely, and the mixture was discharged into the blazing crater. The pit was filled and emptied three times in quick succession. The third application permanently extinguished the flames, the steam formed by the drying mud cooling the walls of the crater below the point where they would reignite the oil. This method is shown in figure 3.

The fire burned 16 days and, when finally conquered, the well was found to be flowing at the rate of about 1,000 barrels daily. The condition of the well after the fire had been extinguished is shown in Plate XIX.

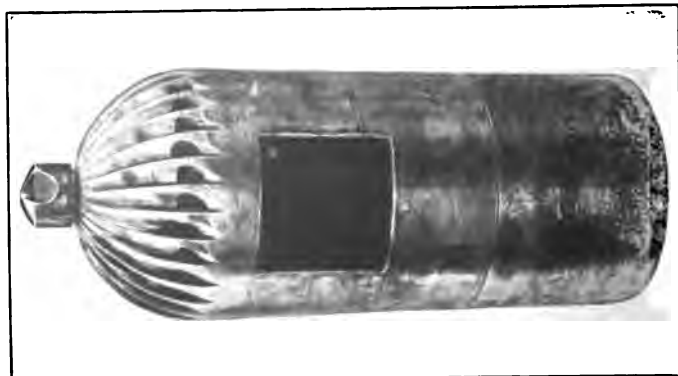
MISCELLANEOUS FIRE HAZARDS AND PREVENTIONS.

HAZARDS AND PRECAUTIONS IN AND AROUND GARAGES.

To prevent the starting of fires by frictional electricity in filtering gasoline, as described at the beginning of this paper, the use of chamois skin for straining gasoline should be done away with entirely; only fine wire gauze should be used.



EXTINGUISHING AN OIL-WELL FIRE BY CAPPING WITH A SWEDGE NIPPLE ATTACHED TO 3-INCH PIPE.



A. SPECIAL 4-INCH BIT MADE FROM A CASEHARDENED NIPPLE.



B. SAFETY MATCHES AND BOX, FURNISHED BY AN OIL COMPANY FOR USE BY EMPLOYEES.

In fact, many cities, especially throughout the New England States, have ordinances prohibiting the use of chamois skin for this purpose.

For drawing gasoline from pumps buckets having wooden bails should not be used, neither should wood or any other insulating material be used to support the funnel in an upright position when gasoline is being poured through it into the tank of a car. The metal of the funnel should invariably be in contact with the metal of the gasoline tank, and, if necessary, a copper chain long enough to rest on the bottom of the tank should be soldered or riveted to the bottom of the funnel spout to insure contact.

The Shell Co. of California uses spouts with copper chains soldered to them for filling its tank trucks, and insists that the chain be in contact with the bottom of the tank before the gasoline is turned on. This company also takes the precaution to ground its trucks whenever they are stabled in the garage, to make sure that any static electricity which has accumulated in them will be drawn off.

Where rubber hose is used for conveying gasoline, the discharge end should be provided with a metal spout or nozzle which has a metallic connection, such as copper wire, with the coupling on the other end. When the gasoline tank on a car is being filled, the nozzle of the hose should be in actual contact with the metal of the tank, and the container from which the gasoline is being drawn should be carefully grounded so that static electricity generated by the gasoline flowing through the hose into the tank will be drawn off to the container and grounded without the formation of a spark. These same precautions apply to gasoline filling stations for railroad cars and tanks on automobile trucks.

For putting out small gasoline fires, especially fires on the floor,* sawdust works surprisingly well. The sawdust floats for a time on the surface of the burning liquid, forming a blanket which excludes the air and smothers the flame. Whether the sawdust is from hard or soft wood appears to make little or no difference, and dry sawdust seems to serve as well as moist.

Mixing sodium bicarbonate with the sawdust, in about the proportion of 8 pounds of carbonate to 1 cubic foot of sawdust, increases its efficacy. This mixture has been used quite extensively in large manufacturing establishments for extinguishing fires in oils and volatile liquids. In large tanks, especially of gasoline, sawdust is not a success because it will sink before the whole surface can be covered.

Where sawdust and bicarbonate are used, the mixture should be stored in conveniently placed cans of suitable sizes, provided with a wide door in the side near the bottom, and a scoop shovel, so that the material can be spread rapidly when required. Where these con-

* Barrier, E. A., Extinguishing fires in oils and volatile liquids in paint and varnish manufactories: *American Paint Jour.*, April 9, 1917.

tainers are not too large, say 3 feet square, there is no danger from spontaneous combustion. However, sawdust alone, if it becomes soaked with oil drippings,* will soon begin to smolder and in time will burst into flames as oily waste will do.

Carbon tetrachloride, as put up by some manufacturers in portable containers of the force pump type, is useful in fighting small fires. Carbon tetrachloride is a water-white liquid that is non-inflammable and is a poor conductor of electricity; it has a specific gravity of 1.632 at 32° F., and is readily miscible with oils. When put up in commercial extinguishers it is usually mixed with some agent such as chloroform, or acetylene chloride, which reduces the freezing point to 20 or 30 degrees below zero.

The specific gravity of its vapor is about $5\frac{1}{2}$ times that of air. When applied to burning oil, carbon tetrachloride tends to extinguish the fire in two ways, by mixing with the oil, thereby diluting it, and also by forming a blanket of noncombustible gas which excludes the air. When it is heated the unconsumed particles of carbon cause a dense black smoke. The fumes are pungent, but brief exposure to them does not cause permanent injury. For best results, carbon tetrachloride should be sprayed on the edges of the fire and not into the body of it. Where a relatively large fire is to be overcome the efficacy of carbon tetrachloride depends largely on the skill of the user.

"Frothy-mixture" solutions, such as those described on page 11 and 16, when put up in portable containers of convenient sizes also are useful in extinguishing small fires about garages. The commonly used acid and soda type of extinguisher is better adapted to fires in woodwork than in oil because of the large excess of water discharged with the gas bubbles, and the flimsy nature of the bubbles.

Wherever possible, filling stations for automobiles should be in the open and not inside of buildings, as in any event highly inflammable gases will arise from the opening of the gasoline reservoir when the automobile tank is being filled. Where this work must be performed inside of buildings, proper ventilation should be maintained at all times—in winter as well as in summer.

Smoking about garages and filling stations should be strictly prohibited, and this rule should apply to the customer having his car filled, as well as to the attendant. All flame lights about the car should be extinguished and the engines stopped before the car is served. No electric switches or fuses should be placed in the filling room.

Buildings for garages should be of fireproof construction throughout. Machine and repair shops run in connection with them should

* Burrell, G. A., Hazards in handling gasoline: Tech. Paper 127, Bureau of Mines, 1915, p. 6.



CONDITION OF FLOWING OIL WELL, WHICH HAD BURNED FOR 16 DAYS, AFTER FIRE WAS EXTINGUISHED.

be in separate buildings, or, if in the same building, should be protected with a fire wall and automatic fire doors. Electric lights, only, should be used and these should be properly protected with wire guards. Open lights or fires of any kind should never be permitted in that part of the garage where there are automobiles. Heating of the buildings should be by steam or hot water.

The buildings should be cleaned thoroughly every day, and all rubbish and other waste material should be gathered up and destroyed. Covered metal receptacles should be provided for all discarded oily waste, as this material when compressed in a lump and allowed to lie unmolested may spontaneously ignite in a short time.

All gasoline storage tanks should be placed underground, preferably outside the building. Gasoline should be drawn from these by pumps; in no case should a gravity flow be arranged. All liquid in the pipes should drain back into the storage tank when the pump is stopped. No cans or tanks of gasoline should be allowed on the floor of the garage other than necessary portable wheeled tanks, none of which should exceed 60-gallon capacity.

The use of gasoline for cleaning any part of an automobile should be prohibited except in a special room, thoroughly ventilated and used for this purpose only. Where such cleaning is done out of doors, it should not be performed closer than 15 feet from any door or opening in the buildings.

Garage waste basins, sinks, or floor drains should never be directly connected with any house drainage or sewer system. Vapors arising from light hydrocarbon compounds, when mixed in proper proportions with air, are highly explosive, and when confined in a sewer system are a constant source of danger.* All grease, oil, and inflammable liquids should be removed from waste water by traps or separators before the water is permitted to enter the sewers.

"No smoking" signs should be posted in prominent places about the premises, as well as other signs explaining the dangers involved in handling the pumps or other apparatus, and giving safe methods for operation.

HAZARDS AND PRECAUTIONS ABOUT TANK FARMS AND REFINERIES.

TANK CONSTRUCTION.

As has already been stated, all tanks about tank farms and refineries should be of steel construction throughout with gas-tight roofs on steel roof supports. Tank stairways should also be of

* Burrell, G. A., and Boyd, H. T., Quantity of gasoline necessary to produce explosive conditions in sewers: Tech. Paper 117, Bureau of Mines, 1916, p. 16.

steel. Gage holes should be fitted with tight iron caps, which can be screwed down and will prevent the escape of gas. Swing pipe lines should pass through stuffing boxes of some such type as that described in Bulletin 155.* These boxes should be kept at all times in gas-tight condition. A vent pipe of proper size should lead from a point near the apex of the roof down the side of the tank, and thence underground on a true gradient to a point outside the fire levee, where it should terminate in a vertical stand pipe at least 20 feet high. This pipe should be so laid that the lowest point is at the bottom of the stand pipe, where a small drain should be provided to remove any possible accumulation of water or condensate from the gases. A tee having each run closed with a fine meshed wire gauze, should be "bull-headed" into the top of the stand pipe.

As has been previously mentioned, an arrangement whereby gases from vent pipes would be passed through an absorber or condenser or otherwise profitably utilized, would be far better than releasing the gases to the atmosphere.

PIPE LINES.

Pipe lines connecting storage tanks should be underground for at least part of the distance, or otherwise thoroughly grounded. The writer has been unable to find any instance where a tank has been ignited from lightning following exposed piping, but such a condition might easily exist. Therefore it is a wise precaution to bury the pipes in the ground or, in some localities, even place insulating joints in them.

LOADING STATIONS.

Fires are said to have been caused at loading stations, where ships discharge or take on oil, through electrical sparks formed when connection to the ship was being made or broken. The writer has been unable to find any instance where the origin of the fire was actually traced to this cause, but it is quite possible that fires could be started in this way, especially where the pipe lines leading from the wharves pass near power lines, electric railways, etc. Most companies ground their loading pipes at the wharf. This is done by soldering a copper wire to the pipe; the other end of the wire is attached to a copper plate, which is sunk in the mud beneath the water.

SUCTION PIPES.

All tanks should be provided with large suction pipes so that in case of fire as much oil as possible can be removed to other tanks or

* Bowle, C. P., Oil storage tanks and reservoirs, with a brief discussion of losses of oil in storage and methods of prevention: Bull. 155, Bureau of Mines, 1918, p. 17.

reservoirs. Tanks containing crude oil should also be provided with bottom drains, connected with piping discharging at a safe distance from the tank. As the tank burns, these drains should be kept open to remove the water that settles from the oil. This precaution is very important, as a small amount of water in the bottom of a tank when converted into steam will cause the tank to boil over violently and the blazing froth may be carried by the wind along the ground and over the top of the fire levees, spreading the fire to other tanks or structures.

LEVEES.

Where possible, tanks should be surrounded with a dike or levee of sufficient height to hold $1\frac{1}{2}$ times the capacity of the tank. Each tank having a capacity of 5,000 barrels or more, which is used for the storage of oil, should be placed at least 300 feet, measured from shell to shell, from any other tank, and at least 150 feet from derricks, buildings, or other inflammable structures.

For a distance of at least 150 feet from the tank the ground should be kept free from weeds, grass, and rubbish.

LIGHTNING RODS.

The writer has made many inquiries among operators regarding the use of lightning rods, but has been unable to find any instances where there is proof that their use has prevented a tank or other structure from being struck. The fact that they present a line of least resistance for electricity to pass from a rain cloud into the ground might prove a serious menace to the structure upon which they are placed because of the enormous voltage they might be required to carry.

PRECAUTIONS ABOUT OIL STILLs, ETC.

Oil stills, heat exchangers, agitators, dephlegmators, etc., should preferably be placed in the open. Where protection from the elements is necessary, roofs and roof supports should be of fireproof materials throughout.

Concrete or brick fire walls of reasonable height (say 3 feet 6 inches) should be constructed at various points about the stills and other apparatus, dividing the entire installation into small units where possible fires can be confined until they are extinguished. In the opinion of the writer this provision is important and should be incorporated into the design of every refinery constructed.

RUN-DOWN TANKS, ETC.

Storage tanks, run-down tanks, stock tanks, agitators, and other closed containers should be equipped with steam smothering lines

which will admit steam into the top of the container on a moment's notice. On the approach of a thunderstorm, steam should be turned into the tanks, and the space between the surface of the oil and the roof of the tank kept filled with steam until the storm has passed.

POSITION OF TRANSFORMERS.

Where electric power is used for operating any part of a refinery the transformers should be at a safe distance from all sources of inflammable gases. This will usually mean placing the transformers outside of the refinery. Great care should also be exercised in placing switches and motors, as sparks from making and breaking of circuits have often been the cause of disastrous fires.

SMOKING.

Forbid smoking about the plant and see that the rule is enforced. Post "No smoking" signs in all prominent places. Provide a room where the men can smoke after the lunch hour. This room should be away from the other structures and should be of fireproof construction throughout.

MATCHES.

Forbid the use of "strike anywhere" matches. Permit no matches to be used about the plant except those that strike only on the box in which they are furnished. The Producers' Oil Co. furnishes its employees with safety matches, free of charge, put up in boxes having a warning printed on the outside. One of these boxes is shown in Plate XVIII, B.

CHANGE ROOMS.

Provide well-ventilated metal lockers for the employees' clothing. These should be installed in a fireproof building such as the smoking room. Never permit employees to dry wet clothing on steam radiators; drying clothing in this way has caused many a fire. Wet garments should be hung up to dry by circulation of air. Never permit employees to hang wet garments on electric wires.

FIRE BRIGADES.

Tank farms and refineries should equip and maintain a fire brigade, the members being employees about the plant. If the plant force is too small for forming such an organization, the force should be combined with that of some adjacent plant or factory. The organization of the brigade should be along the lines of a city fire com-

pany. In organizing and equipping it, probably no better advice could be obtained than that of the fire chief in the city or town where the plant is situated or in the nearest adjacent city.

WATER SYSTEMS.

A high-pressure water system should be maintained, and fire hydrants should be placed at convenient positions about the plant, especially in the vicinity of wooden structures. The hydrants should be of standard construction and should have at least two 2½-inch outlets with separate valves. The threads on the outlets should correspond exactly to those on the hose of the nearest city fire department. If there is no public fire department then the threads should correspond to those on the hose coupling of the nearest factory or refinery. This is very important.

Caps to hydrant outlets should be kept well oiled and not permitted to get jammed. All hydrants should be tested at least once a year. In cold localities this should be done in the summer time.

Cotton, rubber-lined hose should be tested once a year with water under a pressure of 100 to 125 pounds. Also, water should be run through it at least three times a year to preserve the lining. Unlined cotton hose should not be tested with water; such hose rots quickly from moisture and should be kept as dry as possible at all times. Extra hose should preferably be hung up or placed on an inclined plane. Where this can not be done, it should be well dried, then loosely rolled, and laid flat on a shelf. Hose that has been used with salt water should be thoroughly cleaned with fresh water before being dried.

HAZARDS AND PRECAUTIONS ABOUT DRILLING AND PRODUCING WELLS.

Many fires about drilling wells have been started by having the forge inside of the derrick, also by having an open fire in the derrick in cold weather. Neither of these practices should be permitted. Tools should be dressed at a reasonable distance from the rig, or, better still, at some central station. However, in "wild cat" work sending tools to a central station is seldom feasible.

Gas fires about oil wells being drilled are in most instances wholly inexcusable, as permitting gas to escape unchecked from the well is a wasteful and, as a rule, unnecessary procedure. The gas should be shut in as the drilling proceeds.*

* Lewis, J. O., and McMurray, W. F., The use of mud-laden fluid in oil and gas wells: Bull. 184, Bureau of Mines, 1916.

POSITION OF BOILERS.

Boilers should be so placed that they will not be a source of danger if a flowing well is brought in, or if flow tanks or stock tanks are overtopped. In some districts having prevailing winds, as along sea coasts, it may be feasible to place the boilers on the windward side of the well so that the greater part of the time the well gases will be blown away from and not toward the boilers. It is well to have wire gauze protectors over the tops of the boiler stacks, even at plants where oil is used for firing the boilers.

LIGHTS FOR RIGS.

Drilling rigs should be lighted, where possible, with electric lights and not with open torches. At producing wells, only electric lights should be used; neither these nor the wiring should be placed on the derrick, but rather on a pole several feet from it, and the bulbs should be protected with wire guards. If the well is flowing or producing much gas, it is better to have the lights in a cluster on a pole 50 feet or farther from the well.

LUBRICATION OF BEARINGS.

All bearings about the machinery, especially the bull-wheel, calf-wheel, and sheave-wheel bearings, should be kept thoroughly oiled. Frayed bull ropes should be discarded and replaced with new ropes, as any rubbing or slipping of the rope may create heat sufficient to ignite gas issuing from the well. The bull-wheel brake should be provided with a properly installed water spray and this should be used before, not after, the bull wheel begins to smoke.

STATIC ELECTRICITY.

Static electricity generated by the band-wheel belt, or other moving parts of the machinery, has often caused fires. J. C. McCue, superintendent of the Producers Oil Co., cites an instance where he watched static electricity sparking between the band-wheel belt and a wet board, one end of which was buried in the ground, for two hours or more, until the board burst into flame. Mr. McCue takes the precaution to see that all machinery parts are grounded and that belts are provided with properly constructed copper brushes attached to pipe; the pipe being grounded.

An instance has been brought to the attention of the writer where a gas well in process of being drilled was ignited three times before the cause was found to be static electricity generated at the band wheel, passing through the shaft of that wheel into the sand reel

and along the sand line to the bottom of the bailer, where it formed a spark in discharging from the bailer into the top of the casing, as the bailer was being lowered into the well.

SHOOTING WELLS AND BLOW-OUTS.

Fires have been caused in shooting wells, and in striking gas pockets while drilling, by rocks being blown forcibly against the sheave wheels or rig irons.

However, in the majority of blow-outs the fire, if there is one, will be caused by gas or oil coming in contact with the boiler fires. Sparks produced by rocks striking against the rig iron will not ignite the column of gas or oil unless the spark happens to be formed on the outside of the column where there is sufficient air for combustion.

ALLOWING DRILLING CABLE TO SLIP THROUGH CLAMPS.

Numerous instances are on record where fires have been started about drilling wells, which were making a small amount of gas, through permitting the wire drilling cable to slip through the drilling clamps when "hitching" the tools over. This is bad practice, for not only is the fire hazard increased but the cable and equipment may be damaged or the driller and his assistants injured.

PRECAUTIONS ABOUT WELLS WHERE COMPRESSED AIR IS USED.

In using compressed air for increasing the recovery of oil from wells, it is stated^a that "air-gas" used in gas engines has been ignited and the flame traveled back in the pipes to the well. This can be prevented by inserting at the proper point in the gas line a section of larger pipe filled with small iron tubes or rods that will smother the flames by cooling, much the same as the gauze in a safety lamp prevents gases being ignited by the flame of the lamp. Sometimes oil will flow from a well by the compressed air, and fires are reported to have been caused by oil getting into the air-gas and reaching the gas engines. This can be prevented by installing a trap in the gas line, through which the gas must pass before reaching the engine.

GAS SCRUBBERS.

Where natural gas is taken directly from a well and used to drive engines, fires have been started by sand in the gas striking the sides of the exhaust pipe and causing sparks. This danger can be elimi-

^a Lewis, J. O., Methods for increasing the recovery from oil sands: Bull. 148, Bureau of Mines, 1917, pp. 82-83.

nated by passing the gas through a "scrubber" before it is admitted to the engine. Ordinary tubular boilers are often used as scrubbers. Valves should be placed in such gas lines at safe distances from the engines so that if the exhaust catches fire the supply can be quickly shut off.

ACCUMULATION OF GAS IN RAVINES.

Disastrous fires have been caused by gas from flowing oil wells accumulating in ravines and low places in the vicinity of the wells and there being ignited, the fire striking back to the well along the stratum of gas.

The danger of allowing gas to accumulate in this manner is exemplified by a serious accident* near Drumright, Okla., in May, 1915, although the fire did not strike back to the well. It was a calm, humid evening. An automobile, with a man and two women in it, was passing near some flowing oil wells. As the car crossed a culvert over a small creek, there was a terrific explosion. The women were so badly burned that they died within a few hours. The man was also badly burned. Investigation showed that a body of gas had accumulated along the creek bed, and the head lights of the automobile had ignited this gas. The flash was seen by people several miles from the scene of the accident.

GAS TRAPS.

As soon as possible after a well has been brought in, suitable gas traps should be installed and the gas condensed or otherwise utilized. Permitting gas to escape into the atmosphere is a needless waste, in addition to being a menace to life and property.

ARRANGEMENT OF VALVES FOR FLOWING WELLS.

Many companies equip their flowing wells with an arrangement of valves, as shown in figure 4. The lower valve has an extension stem, made from 1-inch pipe, of such length that the valve can be operated at 50 or 75 feet from the derrick. If the derrick, or the oil issuing from the flow lines should catch fire, this valve can be closed and the oil shut off until the fire is extinguished.

MATCHES.

"Strike anywhere" matches are responsible for many fires. Their use should be strictly prohibited about producing wells and drilling wells from which gas is flowing. As has been previously pointed out, only matches that strike on the box in which they are furnished

* News item, Two women lose their lives; man with them badly burned: Oil and Gas Jour., vol. 13, May 20, 1915, p. 23.

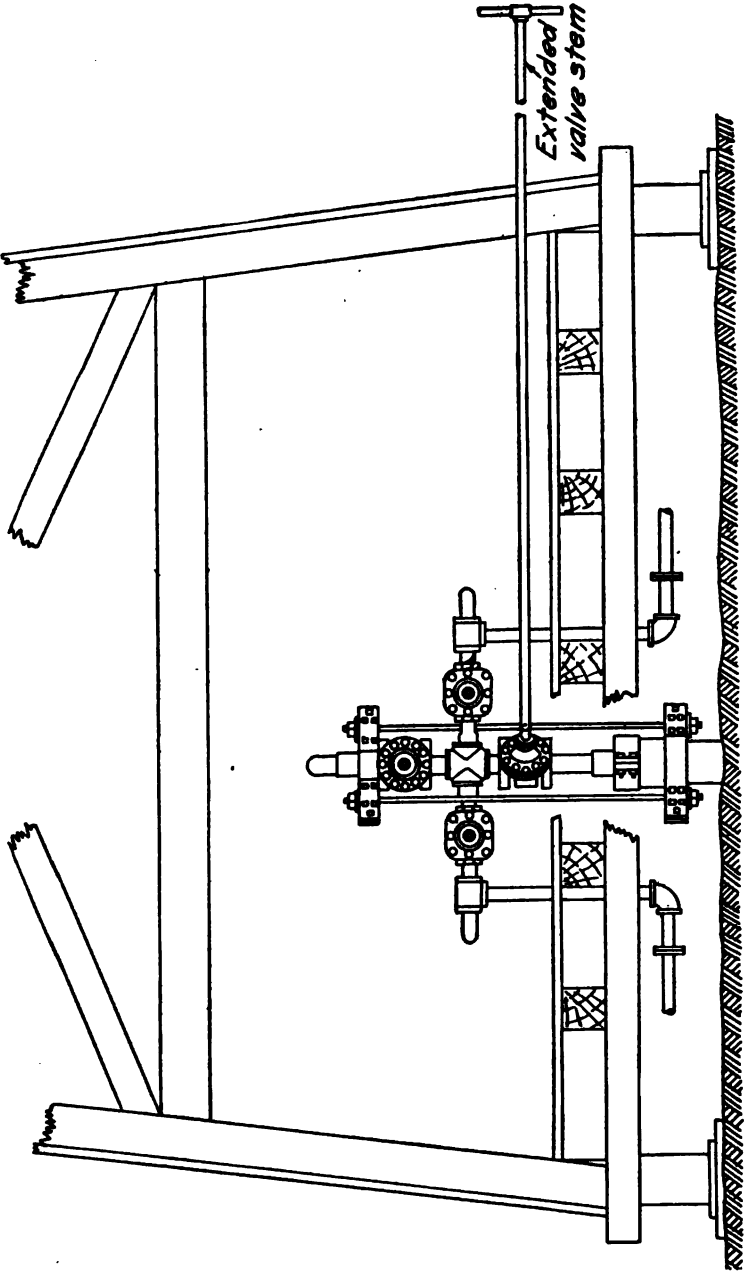


FIGURE 4.—Arrangement of valves for flowing wells.

should be permitted. "No smoking" signs should be posted about such wells, and the rule should be enforced.

INSURANCE RATES.

If the precautions outlined in this paper are put in practice by operators, the result will be a material reduction in fire hazards, which should reduce fire insurance rates. Just what the amounts of the reduction in insurance rates will be depends on the nature of the risks, and the particular underwriting company covering the district.

It is recommended that operators, when laying out new work or providing fire-fighting apparatus for structures already in place, consult the underwriters covering their particular district and adjust their installations, as far as possible, to conform with the requirements of these companies, in order that a maximum reduction in rates (if insurance is to be carried) may be obtained.

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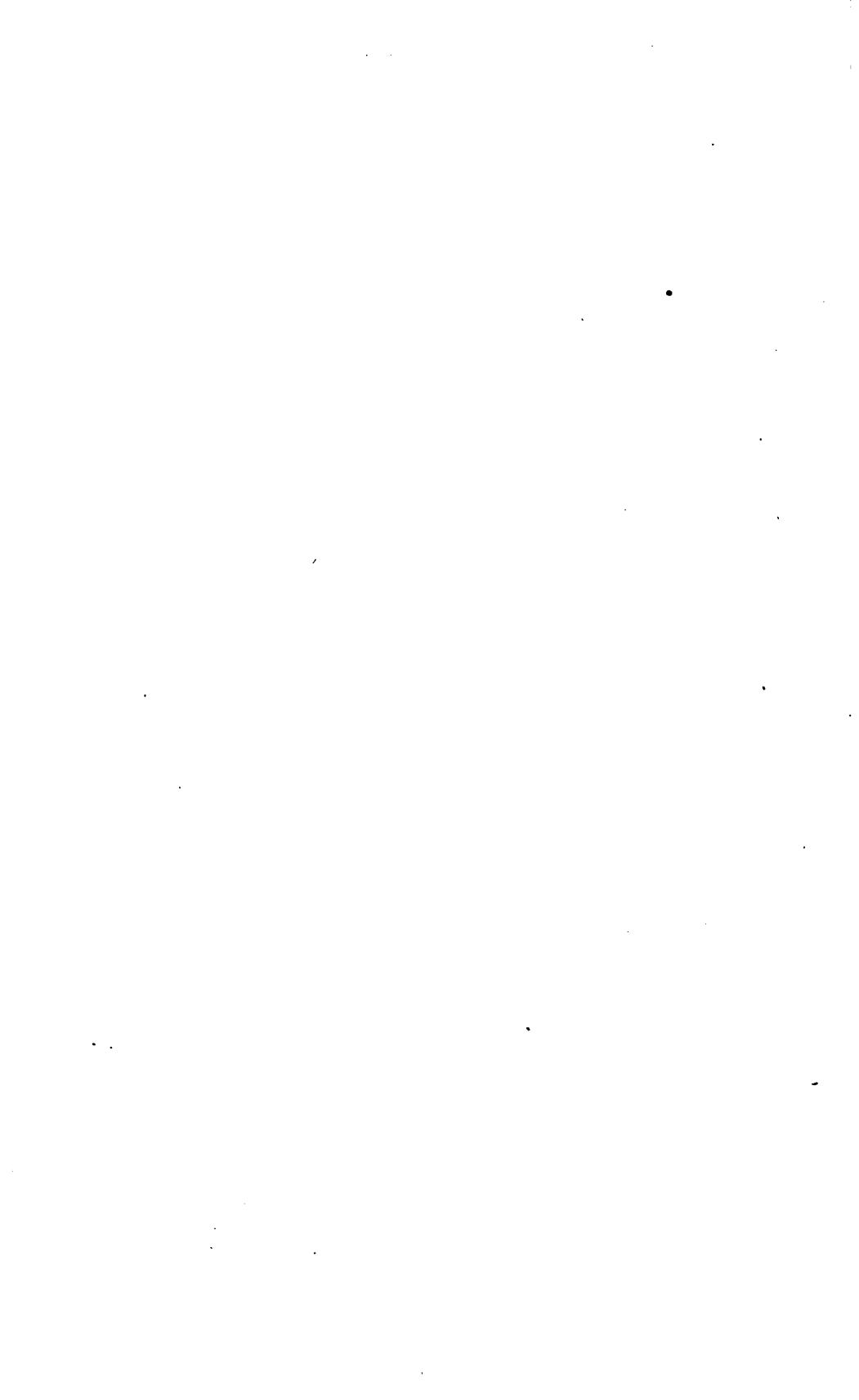
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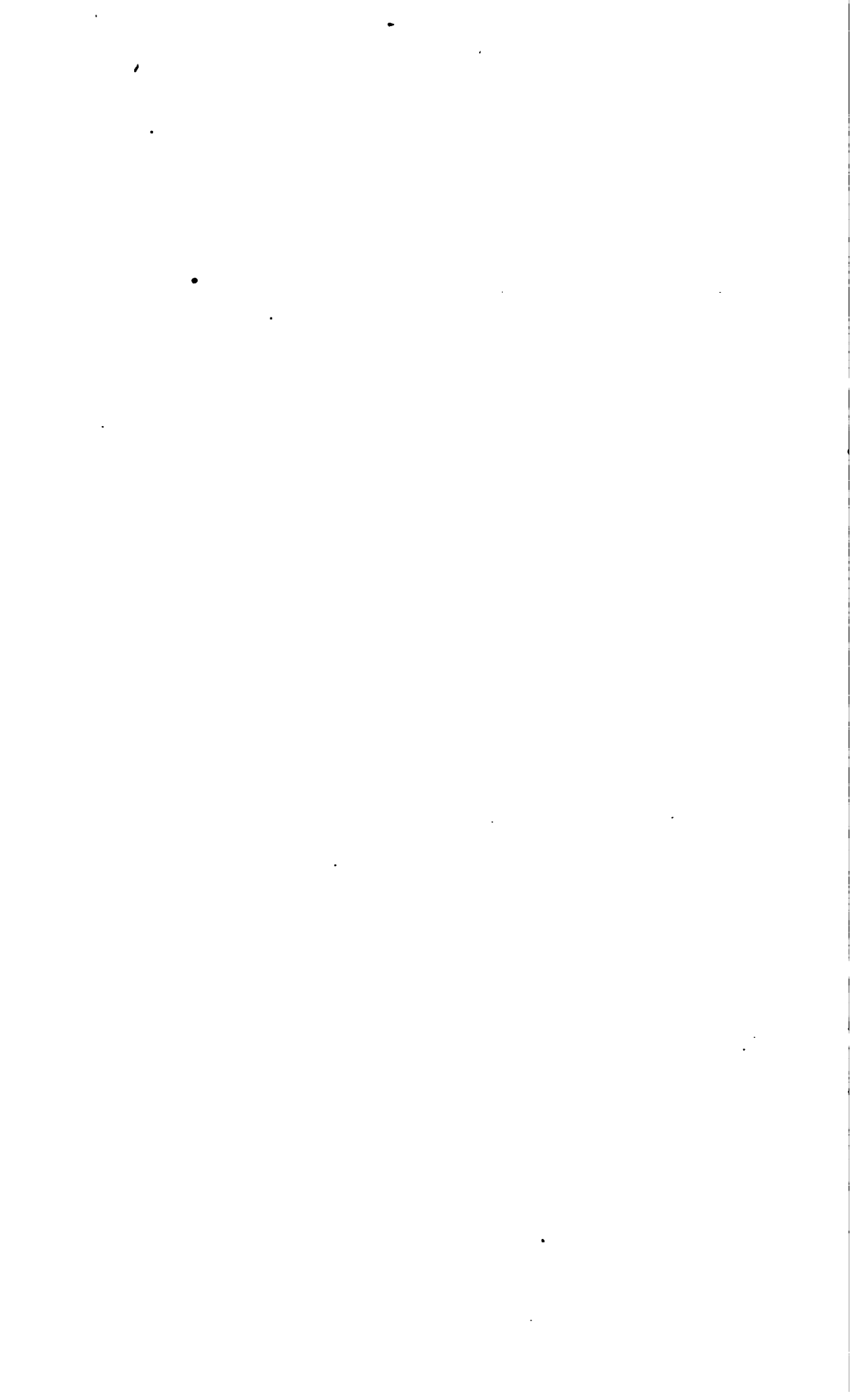
INDEX.

A.		Page.		Page.	
Acetic acid, use of, in frothy-mixture system		15		Empire Gas & Fuel Co., portable well extinguisher of	24
Aluminum sulphate, use of, in frothy mixtures	11, 16			Extinguisher for oil-well fires, description of	24, 31
Arsenious oxide, use of, in frothy-mixture system	11			figure showing	26, 30
Associated Pipe Line Co., California, frothy-mixture system of	10-15			view of	24, 27
B.				F.	
Ballard, H. O., portable well extinguisher of	24			Fire brigades, organizations of	36
view of	24			Fires, oil and gas, losses from	5
Barrier, E. A., cited	31			statistics of	7
Bibliography on oil fires	43-45			Foam mixing boxes, description of	18
Boiler stack, use of, in extinguishing oil-well fire, figure showing	26			view of	18
view of	27			Foam slides, construction of	14
Boilers at wells, proper situation of	38			view of	14
Buckets for gasoline, safe construction of	30			Foaming solutions, composition of	11
Bureau of Mines, work of	5			Frothy mixture, effects of, view of	20
Burrell, G. A., cited	32, 33			care of	15
C.				cost of	15
Carbon tetrachloride, properties of	32			ingredients for	11, 15, 16
use of, for small fires	32			preparation of	14
Change rooms for employees, need of	36			solutions, preparation of	14
Clayton, C. P., method of extinguishing oil-well fires, figures showing	26, 27			system, principle of	19
on oil-well fires in Texas	25			use of	10
Compressed air, use of at wells, fires from	39			G.	
D.				Gas, from tanks, danger from	40
Drilling cable, stripping of, fires from	39			lost by fire, statistics of	7
Drilling rigs, bearings of, lubrication of	38			scrubbers, at wells, need of	40
precautions about	37-41			traps at well, need of	40
proper lights for	38			well, fires at, extinguishing of	22-25
E.				Gasoline fires, small, extinguishing of	31
Electricity, static, as cause of fire	8, 30, 31			storage tanks, precautions regarding	33
precautions against at drilling wells	38			See also Tanks.	
				use of, precautions in	30
				for cleaning, precautions in	33
				Garages, fires in, precautions against	30-33
				Glucose, use of, in frothy mixture	11, 16
				Glue, use of, in frothy mixtures	11, 16
				Guerin, William, method of extinguishing gas-well fire by	24
				Gulf field, fires in	6, 7, 8
				Gulf Refining Co., Texas, use of frothy mixture by	20
				H.	
				Hasards at garages	30-33
				at oil wells	37-41
				at tank farms	33-37

	Page.
Hazlett, A. J., cited.....	25
Hose, care of.....	37
I.	
Ingredients for frothy-mixture system.....	11, 15, 16
Insurance rates, possible reduction in.....	42
L.	
Levees for tanks, capacity of.....	35
Lewis, J. O., cited.....	37, 39
Licorice, use of, in frothy-mixture system.....	15
Lightning, fires from.....	5, 6, 7, 8
rods on tanks, objection to.....	35
Loading stations at storage farms, precautions at.....	34
Lombardi, M. B., method of extinguishing oil-well fires.....	29
M.	
McCue, J. C., on static electricity as cause of fire.....	38
Manufacturer's Record, cited.....	23
Matches, safety, compulsory use of.....	36-40
view of.....	36
Mid-Continent field, fires in.....	6, 7, 8
Mixing chambers for frothy-mixture system, types of.....	18
view of.....	18
Moore, Max, use of well extinguisher by.....	24
Mud fluid, use of for extinguishing oil-well fires, figure showing.....	30
O.	
Oil, lost by fire, statistics of.....	7
tanks, fires in, extinguishing of.....	9
Oil-well fires, extinguishing of, methods of.....	22-30
Oil and gas fires, statistics of.....	7
Oil and Gas Journal, cited.....	23
Oklahoma, fires in.....	8
P.	
Pipe line for frothy-mixture system, description of.....	12, 18
view of.....	12, 18
Pipe line, at storage farms, placing of.....	34
Piping for tanks, precautions for.....	35
Precautions at garages.....	30-33
at oil wells.....	37-41
at tank farms.....	33-37
Pumps for frothy-mixture system, types of.....	17
view of.....	12
R.	
Refineries, fire precautions at.....	35

	Page.
S.	
Sawdust, use of for small gasoline fires.....	31
Shutting off oil to extinguish oil-well fire, method of.....	29
Sodium bicarbonate, use of in frothy mixture.....	11, 16
for extinguishing small gasoline fires.....	31
Solution tanks for frothy-mixture system, capacity of.....	16, 17
protection of.....	17
Solutions for frothy-mixture system, agitation of.....	19
Standard Oil Co., Cal., gas-well fire at, control of.....	23
Static electricity, as cause of fire.....	8
precautions against fires from at drilling wells.....	38
Steam, for extinguishing gas-well fires, use of.....	10-23
smothering lines, use of at tanks.....	35
Sulphuric acid, use of in frothy-mixture system.....	11
T.	
Tank farms, precautions at.....	33-37
Tanks, all steel, for oil storage, advantages of.....	22
fires in, extinguishing of.....	9
for frothy-mixture system, capacity of.....	11, 16, 17
construction of.....	11
oil storage, construction of.....	33
safety distances for.....	35
piping for, precautions for.....	35
view of.....	22
See also Frothy-mixture system.	
Texas Co., use of steel tanks by.....	22
Transformers at refineries, precautions for.....	36
Tyron, J. W., on use of frothy-mixture system.....	20
V.	
Valves for flowing wells, arrangement of.....	40
W.	
Water, as extinguishing agent, effects of.....	9
systems for plants and refineries, equipment of.....	37
use of, in extinguishing gas-well fire.....	24
Wedge, W. L., on fires from static electricity.....	8
Wells, oil and gas, precautions at.....	37-41
shooting of, fires from.....	39
Wood roofs, for storage tanks, advantages of.....	22





DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, SECRETARY

BUREAU OF MINES

VAN. H. MANNING, DIRECTOR

MELTING BRASS IN A ROCKING ELECTRIC FURNACE

BY

H. W. GILLETT AND A. E. RHOADS



**WASHINGTON
GOVERNMENT PRINTING OFFICE
1918**

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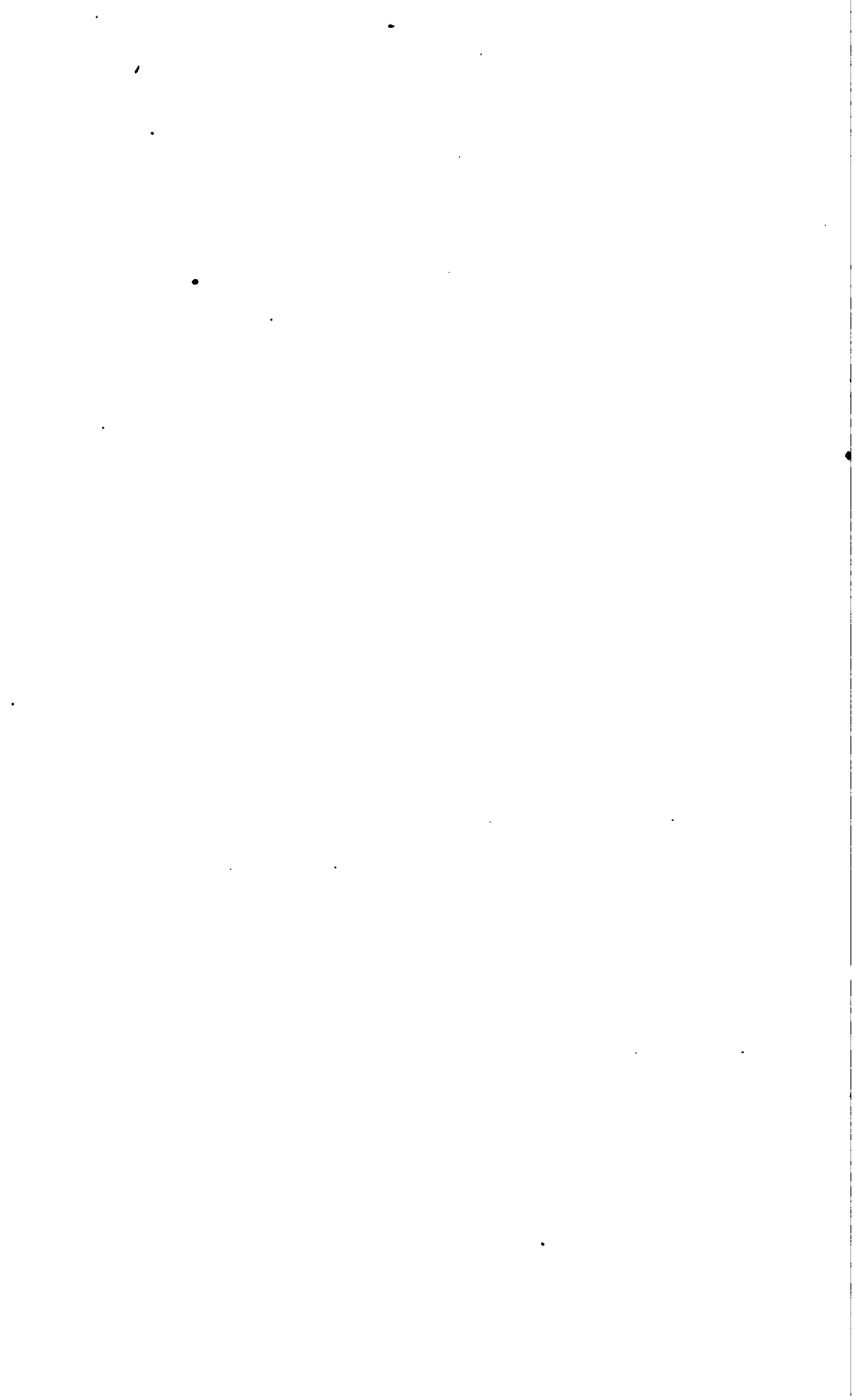
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First edition. July, 1918.

CONTENTS.

	Page.
Preface.....	7
Introduction.....	9
Object of report.....	9
Varying conditions a melting furnace may meet.....	9
Present need for electric brass furnaces.....	10
Theoretical advantages of electric brass melting.....	11
Types of electric brass furnaces commercially tested.....	11
Helberger furnace.....	12
Hoskins furnace.....	12
Baily furnaces.....	12
General electric furnace.....	13
Snyder furnace.....	14
Furnace at a Canadian plant.....	14
Furnaces tested by Hansen.....	14
Rennerfelt furnace.....	15
Bennett furnace.....	15
Hering furnace.....	16
Ajax-Wyatt furnace.....	17
Foley furnace.....	17
Northrup furnace.....	18
Review of the types of furnaces tested.....	18
Necessity for careful correlation in comparing furnace data.....	19
Advantages and limitations of specific types of furnaces.....	19
History of the development of the rocking electric furnace.....	21
Theoretical advantages of a rocking furnace.....	24
Experiments with laboratory rocking furnace.....	25
Construction of furnaces.....	25
Tests on red and yellow brass.....	26
Heats with ingot metal.....	27
Heat L1.....	27
Heat L2.....	27
Heat L3.....	27
Heat L4.....	28
Heat L5.....	28
Heat L6.....	28
Heat L7.....	28
Heat L8.....	29
Heats with miscellaneous scrap.....	29
Heat L9.....	29
Heat L10.....	30
Heat L11.....	30
Heat L12.....	31
Heat L13.....	31



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TABLES.

	Page.
TABLE 1. Results of 28 heats in laboratory electric rocking brass furnace.....	36
2. Summary of data on metal losses in 24 heats.....	39
3. Results of melting manganese-bronze borings in laboratory rocking electric furnace.....	47
4. Data on metal losses.....	74
5. Metal losses in electric-rocking furnace and in coke-fired furnaces compared.....	76
6. Data on power consumption.....	97
7. Summary of power consumption.....	106
8. Data on 1918 tests, 10-hour operation or less.....	110
9. Data for 1918 test, approximately 24-hour operation.....	113

ILLUSTRATIONS.

PLATE I. A, Laboratory rocking electric brass furnace, side view; B, laboratory rocking furnace, end view.....	26
II. Rocking electric brass furnace built at Michigan Smelting & Refining plant, Detroit, Mich.....	54
III. Another view of rocking electric furnace shows electrical apparatus.....	55
IV. General assembly of rocking electric brass furnace as revised.....	56
FIGURE 1. Diagram showing position of furnace during melting, rocking, and pouring.....	56

PREFACE.

It has long been recognized that electric brass melting offers many theoretical advantages, such as saving of zinc, a high quality of product through freedom from contamination of the melt by oxygen and sulphur, the elimination of crucibles, ability to melt large charges, and better and safer working conditions. Commercial experience during the last few years has shown that all these advantages may be attained in practice. Various types of electric furnaces have been devised for brass melting, some of which are suitable only for a rather narrow range of foundry and rolling-mill conditions, or have certain drawbacks that limit their applicability.

In the experimental work of the Bureau of Mines on brass melting, which has been conducted during a period of more than five years, a rocking furnace has been evolved by Dr. Gillett and his associates, which appears fitted to a rather wider variety of conditions than most other furnaces. This furnace has been built in commercial size and submitted to commercial tests, and the results indicate that it not only reduces metal losses, avoids the use of graphite crucibles, and hence the need of ships for importing graphite from Ceylon, but is so economical in use of electric power that no more fuel is required for brass melting, after conversion of the fuel energy into electricity, than if the fuel were used direct in a fuel-fired brass furnace. Not only does the use of the furnace show a large reduction in melting cost at present prices, but it also shows a saving over the melting cost at prewar prices.

Comparison of the cost of melting, on a 10-hour schedule, in the rocking electric furnace and in the coke-fired crucibles of the plant at which the tests were made show that the cost, per ton of charge, for electric power, interest, and depreciation, electrodes, linings, and the heating of ladles is about one-half of the cost, at present prices and present crucible life, of the single item of crucibles for coke fires. Hence under present conditions a huge saving is possible by electric melting. Under normal conditions the saving will be smaller but decided. With 24-hour operation the balance in favor of the electric furnace would be still larger.

The usefulness of such a furnace in the brass industry is evident, and this paper is published in the hope that it may stimulate the use, not only of the rocking furnace but of all other electric furnaces under conditions to which each is adapted, and hasten the savings to the brass melter and the conservation of metal to the country that electric furnaces make possible.

CHARLES L. PARSONS,
Chief Division of Mineral Technology.



MELTING BRASS IN A ROCKING ELECTRIC FURNACE.

By H. W. GILLETT and A. E. RHODES.

INTRODUCTION.

In its study of methods for reducing metal losses in the non-ferrous metal industry, the Bureau of Mines has conducted a long series of experiments on electric brass melting and collected much data on the experiments of others. Reports bearing on this work that have already been published by the Bureau of Mines are Bulletin 73, "Brass-furnace practice in the United States," and Bulletin 77, "The electric furnace in metallurgical work."

A comprehensive report describing the design and operation of all types of electric brass furnaces and showing their performance in experimental tests on a commercial scale is in course of preparation. However, commercial tests of several new and promising types of furnaces are still under way, the results of which should be included in any general discussion of the subject. For this reason it has seemed desirable to issue a preliminary bulletin giving the data on a type of furnace developed in one stage of the bureau's work.

OBJECT OF REPORT.

The object of this paper is to set forth in detail the possibilities and limitations of a rocking electric brass furnace. The general problem of electric brass furnaces is discussed and various types of furnaces are compared only so far as is necessary for the purpose of this report. Information on such other furnaces as have found commercial use is obtainable from the makers of the various furnaces. Reference to some of the more important articles in scientific and technical publications, dealing with the general subject of electric brass melting and with the performances of various specific types of furnaces, is made herein in order that interested persons may pursue the subject further.

VARYING CONDITIONS A MELTING FURNACE MAY MEET.

A brass furnace—for brevity the term brass is here loosely used to include brass and bronze—may have to meet widely varying conditions, according to the work to be performed. A brass rolling-

mill, in general, works with alloys of high zinc content, which are normally made up in large proportion from new metals, and such a mill can, and often does, operate on a 24-hour basis. The tonnage of any given alloy is usually large enough for separate furnaces to be used for melting different alloys. There is a possibility of utilizing furnaces of fairly large capacity in the rolling-mill industry.

Brass foundries vary in size and kind of output from the little jobbing shop, making small quantities of alloys of many different compositions, to the departments of huge manufacturing plants turning out a vast tonnage of a few standard compositions. The type of castings may vary from small intricate patterns, requiring very hot metal, to large castings that are best poured with rather cool metal. The work may be such that night molding is feasible, and operating 24 hours a day is desirable, or be such that operation is practicable only in the daytime. Depending on the nature of the plant and of the work, a furnace may melt the same alloy throughout the year, or may not make two consecutive heats on the same alloy. The alloys may vary from pure copper through bronze, red brass, leaded bearing-metals, half-yellow and half-red brass, yellow brass, and manganese bronze to brazing spelter, or from no zinc to 50 per cent zinc and no lead to 25 per cent or more lead.

Plants refining waste materials and scrap may have as wide a range of alloys as that given in the preceding paragraphs, and in addition their operation may be complicated by the use of very bulky and dirty materials.

Obviously, no single size or type of furnace, whether fuel-fired or electric, can satisfactorily meet all the various conditions encountered in nonferrous melting.*

PRESENT NEED FOR ELECTRIC BRASS FURNACES.

Fuel-fired furnaces are divisible into several types, according to the kind of work that is to be done. The two chief classes, disregarding minor subdivisions, are crucible furnaces and open-flame oil furnaces. With the advent of an acute crucible shortage, coupled with a five-fold increase in price and a vast decrease in quality, the use of crucible furnaces has become more and more confined to the production of alloys high in zinc, such as rolling-mill brasses whereas the use of open-flame oil furnaces for making red brasses and bronzes—alloys low in zinc—has markedly increased. That is, the metal losses in melting yellow brass in open-flame oil furnaces have in general been found to overbalance even the present high cost of crucibles.

But even for red brass and bronze, many users still find it undesirable to replace crucible furnaces with types not using crucibles.

* Compare, Clamer, G. H., *Melting brass in the induction furnace*, Jour. Am. Inst. Metals, vol. 11, 1917, p. 381.

Zinc losses are high in melting yellow brass, even in crucibles, and there is need for furnaces that will eliminate crucible costs and reduce the zinc losses. In melting bronzes the need is for furnaces that will eliminate crucibles and, if possible, do away with the disadvantages of open-flame oil furnaces.

War conditions have greatly accentuated these needs, and have hastened the commercial development, trial, and application of various types of electric brass furnaces, for theoretically these furnaces seem capable of meeting the situation.

THEORETICAL ADVANTAGES OF ELECTRIC BRASS MELTING.

The theoretical advantages of electric brass melting are obvious.^a They are as follows:

1. Metal losses by oxidation and volatilization may be reduced, because electric furnaces may melt the charge in a nonoxidizing atmosphere and may be tightly closed to prevent volatilization losses.

2. As regards thermal efficiency, a greater proportion of the heat produced in an electric furnace may be utilized than of that in a fuel-fired furnace.

3. The heat input and hence the temperature of the melt may be more closely controlled than in fuel-fired furnaces.

4. Storage and handling of fuel and ashes are eliminated.

5. Metal of "crucible quality" may be produced without the use of crucibles.

6. Working conditions as to health, comfort, and safety of the melters are better than with fuel-fired furnaces.

TYPES OF ELECTRIC BRASS FURNACES COMMERCIALY TESTED.

General information on the various types of electric furnaces used in the metal industries can be found in the treatises by Stansfield^b; by Rodenhauer and Schoenawö^c; in Bulletin 67^d, and Bulletin 77^e of the Bureau of Mines; in the Transactions of the American Electrochemical Society, the Transactions of the Faraday Society, and in the issues of Metallurgical and Chemical Engineering.

Not every type of electric brass furnace meets every melting condition in the industry, nor does it necessarily have all the advan-

^a See Roeber, E. F., *Manufacture of brass in the electric furnace*, *Electrochem. and Met. Ind.*, vol. 3, 1908, p. 4; Clamer, G. H., and Hering, C., *The electric furnace for brass melting*, *Trans. Am. Inst. Metals*, vol. 6, 1912, p. 96; Miller, D. D., *The electric furnace for heating nonferrous metals*, *Jour. Am. Inst. Metals*, vol. 11, 1917, p. 267.

^b Stansfield, A., *The electric furnace*, 1914, 415 pp.

^c Rodenhauer, W., and Schoenawa, J., trans. by vom Baur, C. H., *Electric furnaces in the iron and steel industry*, 1917, 419 pp.

^d Lyon, D. A., and Keeney, R. M., *Electric furnaces for making iron and steel*, *Bull. 67, Bureau of Mines*, 1914, 142 pp.

^e Lyon, D. A., Keeney, R. M., and Cullen, J. F., *The electric furnace in metallurgical work*, *Bull. 77, Bureau of Mines*, 1914, 216 pp.

tages theoretically possible in an electric furnace. Hence various forms have appeared, designed to meet various conditions.

HELBERGER FURNACE.

Among the crucible furnaces that have been tested on a commercial scale in the United States is the Helberger,^a a German crucible tilting furnace of 200-pound capacity, which was tested by the National Cash Register Co., at Dayton, Ohio. The tests showed that the furnace had an excessive power consumption, poor crucible life, and was generally inconvenient and of slight promise.^b

HOSKINS FURNACE.

A Hoskins furnace^c with carbon blade resistor and removable crucible, 200-pound capacity, made by the Hoskins Manufacturing Co., was tried by the Commonwealth Edison Co. at the plant of the L. Wolff Manufacturing Co., Chicago.

This furnace showed low metal losses, but the power consumption was high and the crucible and the lining were not very durable. The furnace seemed scarcely applicable under the conditions prevailing at that time.

BAILY FURNACES.

Two Baily crucible furnaces built by the Electric Furnace Co. of America were tried out at the Detroit Copper and Brass Rolling Mills. The first one tested was a tilting furnace. This furnace, because of mechanical defects, never melted enough metal to give any reliable data and appeared of so little promise that no further development of it was made. The second furnace was of the lift-out type, taking eight No. 70 crucibles, each of 200-pound capacity. This furnace also failed, because of thermal inefficiency and low output, and was of such design that when the pots were being pulled the heat from the furnace made the work of handling the furnace almost unbearable.

A tilting noncrucible Baily furnace, single-phase, with a granular resistor, melting about 1,000 pounds per heat, was then designed and has found commercial use. This furnace, which has been described by Baily^d and by Miller,^e may be classed as somewhat

^a Helberger, H., U. S. patent No. 932986, Transforming smelting furnace, Aug. 31, 1909, and No. 1023309, Electric furnace, Apr. 16, 1912.

^b Dorsey, H. G., Tests on electric furnaces for brass foundries; *Trans. Am. Inst. Metals*, vol. 8, 1914, p. 246.

^c Marsh, A. L., Electric furnace, U. S. patent 883783, Mar. 24, 1908.

^d Baily, T. F., Resistance type furnace for melting brass, read before Am. Electrochem. Soc., Oct., 1917, not yet published; Annealing and heat-treating of steel and melting of nonferrous metals in the electric furnace, *Met. and Chem. Eng.*, vol. 17, 1917, p. 91; Baily electric metal melting furnaces, *Met. Ind.*, vol. 15, 1917, p. 399.

^e Miller, D. D., The electric furnace as a medium for heating nonferrous metals, *Jour. Am. Inst. Metals*, vol. 11, 1917, p. 257.

analogous to a reverberatory furnace. Bailly furnaces of this type for brass melting are installed at the works of the Lumen Bearing Co., Buffalo, N. Y.; Baltimore Copper Smelting & Rolling Co., Baltimore, Md.; Bridgeport Brass Co., Bridgeport, Conn.; and the Hays Manufacturing Co., Erie, Pa.

This furnace, which is applicable to alloys of any zinc content, reduces metal losses, does away with the use of crucibles, and gives good working conditions. For satisfactory performance, it has to be operated continuously or to be heated empty during all or part of the night. The power consumption is higher than that of various other types of electric brass furnaces operating under a similar time schedule and on similar alloys. The high-power consumption in this type of furnace is due to the fact that most of the transfer of heat from the source, the resistor, to the charge is indirectly by reflection from the roof. The rate of power input per unit of capacity is lower in this type than in most other types because too high a rate means too high a working temperature for both resistor trough and roof. It is customary to install a pyrometer in the roof and to take care not to let the roof get overheated. This type can not be "forced." The power used to supply radiation losses from the walls and the roof is, therefore, a large proportion of the total power supply, and the thermal efficiency is, as in any low-powered furnace, rather low. The furnace does not respond promptly to changes in power input and hence temperature control is much more difficult than in most other types.

GENERAL ELECTRIC FURNACE.

Another furnace, the General Electric, or the Collins-Valentine,^a a tilting noncrucible furnace of 1,500-pound capacity, of the smothered-arc type, made for one, two, or three phase operation, and having automatic electrode control, is described by Miller;^b it also may be classed as being of the reverberatory or reflected-heat type. After a period of tests at the plant of the General Electric Co. at Schenectady, N. Y., this furnace has been installed for further tests at the Chicago plant of the Crane Co. This type has an even less direct transfer of heat from the source to the charge than the granular resistor type. The smothered arc allows the use of a higher rate of power input per unit of capacity than does a granular resistor, but the higher rate involves a more severe strain on the roof, which in this type is a weak point.

The furnace is still in the experimental stage and is not yet developed to the point where it is considered ready for general commercial service. This type when successfully developed is theoretically

^a Valentine, I. R., Electric furnace, U. S. patent 1242275, Oct. 9, 1917.

^b Miller, D. D., Work cited, p. 274.

15. YOUNG, J. R. Storing and handling of gasoline. *Oildom*, vol. 5, August, 1915, pp. 52-53, 56. Gives rules and regulations.
16. FUEL OIL JOURNAL. Extinguishing tank fires by the Erwin patented system. Vol. 6, August, 1915, p. 44. Discusses advantages and claims of apparatus.
17. NATIONAL PETROLEUM NEWS. Use of hollow tile for tankage insulation. Vol. 7, October, 1915, p. 62. Discusses effect on evaporation loss and as fire protection.
18. OIL AND GAS JOURNAL. Foam to extinguish oil fires. Vol. 14, Oct. 21, 1915, p. 23. Explains methods of application and conditions necessary for efficient results.
19. NATIONAL BOARD OF FIRE UNDERWRITERS. Regulations for the installation of containers for hazardous liquids. 1915, 23 pp.
20. GUNNISON, A. W. Factors affecting fire hazard of oil producing and refining properties. *West. Eng.*, vol. 6, 1915, pp. 245-246. Gives precautions for reducing danger from fire.
21. DUNN, B. W. The Ardmore (Okla.) explosion. Special Bull. 2, Bureau for the State Transportation of Explosives and other Dangerous Articles, 1915, New York, 6 pp. Report on explosion caused by escape and vaporization of casing-head gasoline in a tank car.

1916.

22. MINING AND OIL BULLETIN. Soda foam extinguishers for oil fires. Vol. 2, February, 1916, pp. 70-71. Explains advantages, principle, and construction of extinguisher.
23. AUTOMOBILE. How pouring gas creates electricity. Vol. 34, Feb. 24, 1916, p. 385. Describes ways fires can be caused at filling stations and suggests precautions.
24. BUREAU FOR THE SAFE TRANSPORTATION OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES. Report of the Chief Inspector, February, 1916. 85 pp. Contains statistics on fires, explosions, and accidents in 1915; circular letters issued by the bureau relative to storage.
25. HELDT, P. M. Fire hazards and fire prevention in the garage. *Horseless Age*, vol. 37, Apr. 1, 1916, pp. 266-267; Apr. 15, pp. 320-321. Discusses causes of garage fires, giving statistics for 1911 and 1912, and suggests preventive measures.
26. NATURAL GAS JOURNAL. Extinguishing fires, using the foam system. Vol. 10, April, 1916, pp. 143-147. Describes method and equipment; gives formulas for the solutions.
27. PETROLEUM AGE. To put out small fires. Vol. 3, April, 1916, p. 14. Briefly describes extinguisher for gasoline fires, using sawdust mixed with bicarbonate of soda as extinguishing medium.
28. OIL AND GAS JOURNAL. New plan for extinguishing fires. Vol. 15, June 15, 1916, p. 31. Describes a foam system.
29. SCIENTIFIC AMERICAN. Extinguishing oil-tank fires with a blanket of foam. Vol. 115, July 8, 1916, p. 44. Describes system developed by the Standard Oil Co. of California, using "fire foam."
30. FUEL OIL JOURNAL. How the Millway fire was put out. Vol. 7, September, 1916, p. 37. Report on oil-tank fire extinguished by the "foamite" system.
31. FUEL OIL JOURNAL. Oil fire conquered under very difficult conditions. Vol. 7, October, 1916, p. 94. Describes method of extinguishing fire by foamite system.

32. **HEXAMER, C. A.** Report of the committee on explosives and combustibles. Proc. Nat. Fire Protect. Assoc., 1916, pp. 257-281. Contains proposed amendments to various regulations on storage and handling.

1917.

33. **NATIONAL FIRE PROTECTION ASSOCIATION QUARTERLY.** Southwest oil field fires. Vol. 10, January, 1917, p. 271. Reviews losses for the year 1916.
34. **JAMES, G. B.** Oil storage. Nat. Fire Protect. Assoc. Quarterly, vol. 10, January, 1917, pp. 260-270. Reviews present methods of storing oil, discusses losses from evaporation and fire, and describes protective methods used.
35. **GEYER, O. R.** Fires in the oil fields. Sci. Am. Suppl., vol. 116, Feb. 24, 1917, pp. 120-121. General discussion of oil-field fires from various causes, and descriptions of the extinguishing of especially difficult fires.
36. **THE BUREAU FOR THE SAFE TRANSPORTATION OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES.** Report of the Chief Inspector, February, 1917. 104 pp. Report for the year 1916 includes statistics on fires and accidents during the year.
37. **COLWELL, P. A.** Precautions in fuel-oil storage. Power, vol. 45, June 26, 1917, pp. 886-887. Abstract of paper presented before the Providence, R. I., Engineering Society. Describes proper methods of storage and precautions.
38. **WISE, K. M.** The conservation of petroleum. Oil Age, vol. 13, November, 1917, pp. 10-15. Describes a system of storage and handling for preventing loss by evaporation and fire.

types of brass furnaces before choosing the contact-resistance type as most promising for rolling-mill use in melting alloys high in zinc.

As this furnace is the outgrowth of a long series of large-scale experiments competently directed, it is to be regretted that no actual data on the performance of the furnace, or even of the unsuccessful experiments with other types has been made public.

A furnace of a somewhat similar type is in use in Germany^a in melting ferromanganese, the manganese in which is somewhat volatile, though not so much so as zinc in brass.

HERING FURNACE.

The Hering "pinch effect" furnace^b was tried out thoroughly and on a large scale by the Ajax Metal Co., Philadelphia, Pa., the National Cash Register Co., Dayton, Ohio, and the Scovill Manufacturing Co., Waterbury, Conn., in two-phase and three-phase form. These furnaces poured about 750 pounds a heat.

Tests were made with the furnace, as originally designed, at the plants of all the companies mentioned, also many modifications of it were tested at the Ajax plant. The results were so discouraging that the furnace was abandoned by all these experimenters, chiefly because of the high heat losses in the water-cooling of the metallic electrodes, and mechanical troubles. Some difficulty was found in heating yellow brass of high zinc content hot enough for rolling-mill use, on account of evolution of zinc vapor in the resistor tubes. The furnace showed low metal losses, and its performance indicated that the circulation set up by the "pinch effect" was a desirable feature.

It was obvious in the tests of the Hering furnace that many of the mechanical troubles in that type could be eliminated, and most of the good features retained, if the resistor tubes could be replaced with a resistor loop, thus making an induction furnace. Induction furnaces of the ordinary types used in steel melting, such as the Colby-Kjellin, Frick, Röchling-Rödenhauser, and similar furnaces,^c are not applicable to the melting of alloys of high electrical conductivity, such as brass, bronze, and the aluminum alloys, although they are in use for melting nickel and its alloys, which have electrical resistances of the order of that of iron. If one attempts to melt copper or brass in an induction furnace with the secondary ring horizontal, the high current required (by the low resistance) in introducing sufficient power to

^a Schemmann, W. and Bronn, J., Electric furnace, U. S. patent No. 1056456, Mar. 18, 1913. Rodenhauser, W., Ferromangan als Desoxydation Mittel, 1915, p. 26.

^b Hering, C., Electric furnace, U. S. patent No. 988936, Apr. 9, 1911; and No. 999720, Aug. 1, 1914. Hering, C., A new type of electric furnace, Trans. Am. Electrochem. Soc., vol. 19, 1911, pp. 255-272. Clamer, G. H., The Hering electric furnace for commercial brass melting, Trans. Am. Inst. Metals, vol. 7, 1913, p. 350. Clamer, G. H. and Hering, C., Electric brass melting, Trans. Am. Inst. Metals, vol. 8 1914, p. 270.

^c See Rödenhauser, W. and Schoenawa, J., Trans. by vom Baur, C. H., Electric furnaces in the iron and steel industry, 1917, p. 172.

melt the metal is above the working limit^a of current of the molten conductor. As a result the "pinch" force, which was usefully employed in the Hering furnace, causes the metal to separate in the ring and the flow of current stops.

AJAX-WYATT FURNACE.

In vertical-ring induction furnaces, where the secondary ring is in the form of a loop below a pool of molten metal, the hydraulic head of the molten metal opposes the "pinch" force and may be made high enough to prevent rupture. The Ajax-Wyatt^b furnace is of this type. This furnace, built in 300 and 600 pound sizes, is in commercial use at the Ajax Metal Co. plant, Philadelphia, Pa., several of the furnaces being used there. Two furnaces of the 600-pound size are in use at the American Brass Co. plant, Waterbury, Conn., and 28 furnaces of the 300-pound size at the Bridgeport Brass Co. plant, Bridgeport, Conn. All these furnaces are melting alloys high in zinc and low in lead. They give very low metal losses, and the rapid circulation of metal due to the pinch force, to thermal effect, and to motor effect, causes a stirring and mixing that produces exceptionally homogeneous alloys. So far the Ajax-Wyatt furnace has been built only for single-phase current and in these comparatively small sizes. The power factor, in these sizes, is satisfactory. The power consumption is extremely low, as would be expected, for the heat is generated in the metal itself.

The drawbacks to this type are as follows: The furnace has to be started with a charge of previously melted metal, which causes difficulty in changing from one alloy to another, and necessitates operating 24 hours a day or using enough power on the furnace at night to keep the metal in the resistor loop molten; the furnace lining, in the shape required by the furnace design, will not withstand alloys that contain more than 3 per cent lead.

FOLEY FURNACE.

A vertical-ring, induction furnace of somewhat similar design is built by Charles B. Foley. A Foley single-phase furnace of 1,000-pound capacity has been in experimental operation at the Bristol Brass Co. plant, Bristol, Conn., and three 3,000-pound furnaces are being constructed there. The experimental furnace has operated with 2,200 volts on the furnace primary, which the writers consider unsafe, but Mr. Foley states that it can be built with 440

^a Hering, C., A practical limitation of resistance furnaces, the "pinch" phenomenon; Trans. Am. Electrochem. Soc., vol. 11, 1907, p. 329; vol. 15, 1909, p. 255, discussion by Fitzgerald, F. A. J., p. 278.

^b Wyatt, J. R., Induction furnace, U. S. patent 1201671, Oct. 17, 1916, and Nos. 1235628, 1235629, 1235630, Aug. 7, 1917. Clamer, G. H., Melting brass in the induction furnace, Jour. Am. Inst. Metals, vol. 11, 1917, p. 381.

or 220 volts on the furnace primary. The power factor of the large furnaces is expected to be rather low, though probably better than in horizontal-ring, induction, steel furnaces of similar size. The Ajax-Wyatt and the Foley furnaces differ distinctly in design and in underlying principles, but their metal losses and power consumption will be about the same. There has been less actual melting done in the Foley furnaces than in the Ajax-Wyatt, and much less data is available on them. The theoretical advantages and the operating drawbacks are about the same for both types.

NORTHROP FURNACE.

Realizing the limitations of the vertical-ring, induction type, the Ajax Metal Co. is now developing the Northrup furnace,^a made by the Pyro-electric Instrument Co.; this is of the eddy-current induction type and does not require a ring-shaped secondary. When first developed, the furnace used oscillating current at very high voltages and frequency, instead of alternating current. Later developments indicate that it can be designed to run on 100 volts. The use of condensers or of a special generator is required to give oscillating current. A 60-kilowatt tapping furnace is now under test. This offers the same advantage as the vertical-ring induction furnace in that the heat is generated in the metal itself, with consequent low power consumption, and should be more flexible—that is, should be readily operated on a 10-hour or shorter schedule and should readily permit changes from one alloy to another. The furnace has a very high power factor and is built to take two-phase current.

Theoretically this type of furnace is promising, although as long as condensers are used the cost of construction may be rather expensive. The furnace should give low metal losses. Development has not progressed far enough to show whether mechanical difficulties of construction will limit the furnace to comparatively small capacities. The furnace will probably be developed at least far enough to be available for small jobbing foundries where no other type of electric brass furnace so far developed seems to meet the conditions as well as this type might.

REVIEW OF THE TYPES OF FURNACES TESTED.

In the United States four electric brass furnaces, the Ajax-Wyatt, the Baily, the Rennerfelt, and the Snyder, besides the rocking furnace described herein, are on the market and are in actual commercial use, and three, the Foley, General Electric, and Northrup furnaces, are undergoing commercial tests.

^a Northrup, E. F., Production of high temperature and its measurement, *Met. and Chem. Eng.*, vol. 17, 1917, p. 685.

A large number of other furnaces, including various types not mentioned in the preceding paragraphs, have been tried on a purely experimental scale; many others have been patented or suggested but not tried; comment on these is withheld from lack of space.

NECESSITY FOR CAREFUL CORRELATION IN COMPARING FURNACE DATA.

Much data on the performance of most of the furnaces specifically mentioned, including power consumption, metal losses, electrode consumption, output, and other factors, is at hand, but would require too much space to be given here. The power consumption, for example, depends so much on the nature of the charge, the temperature at which the metal is poured, the capacity of the furnace, the working period—whether the furnace is operated 24 hours daily, 10 hours with some heating at night, or 10 hours with no night heating—the speed of charging and pouring, rate of power input, etc., that any set of figures for power consumption may be, unless all the conditions are given in detail, not only inaccurate, but strongly misleading.

Similarly, figures for metal losses, expressed as percentages, in tests of different furnaces are not directly comparable, but must be carefully examined. For example, a 2 per cent metal loss, given as the performance of some one furnace on a certain alloy, might refer to the net loss on clean ingot metal, after the amount of metal recoverable from dross, spillings, and soakage into furnace linings had been deducted. On the other hand, a 5 per cent metal loss, shown by another furnace working on a similar alloy, may refer to the gross loss, with no deduction for recoverable metal, in melting a charge of dirty, oily borings. As a result, this 5 per cent loss might really mean a much better performance than the 2 per cent loss shown by the other furnace, owing to the difference in conditions and method of calculation.

Therefore, in comparing different electric brass furnaces to determine their suitability for a given set of conditions, it is necessary to be sure that figures given in published reports of tests or in makers' guarantees refer to exactly similar conditions, or else to make suitable allowances for the variations.

ADVANTAGES AND LIMITATIONS OF SPECIFIC TYPES OF FURNACES.

The direct-arc type of furnace is applicable to the melting of pure copper, true bronze, and red brass. Its use is confined to alloys low in zinc, and it should not be used for alloys high in lead, because of the danger of poisoning from the volatilized lead. Such a furnace can be built in large capacities, and three-phase current can be used. It can be operated on a 10-hour schedule without night heating.

The indirect-arc type has about the same advantages and disadvantages as the direct arc, but will handle alloys higher in volatile constituents than the direct arc type.

The contact-resistance type should theoretically be suitable for all alloys and for 10-hour operation. Unfortunately, the only furnace of this type in use for brass melting is available only to the firm now developing it.

The reflected-heat type—which is in two forms, the granular-resistor and the smothered arc—should be applicable to all alloys, but on account of the indirect way in which the heat is applied will be only moderately efficient in power consumption even when working 24 hours a day. On 10-hour operation the heating of the empty furnace at night will be desirable, if not necessary, in order to get a reasonable output in the daytime. This type of furnace will not give as close control of temperature as the other types. It will be at its best in rather large sizes.

The vertical-ring, induction type is especially applicable to alloys high in zinc. Theoretically it can be used for all alloys, but it has not been developed or tested for making bronze. Such a furnace is not suitable for use at plants where one furnace must make successive heats on alloys of different composition. It has a high efficiency when working 24 hours daily on one alloy, and if operated only in the daytime its efficiency may overbalance the cost of using enough power at night to keep the contents molten. It works well in rather small sizes, but its applicability in large sizes has not yet been proved.

The eddy-current type of furnace should be efficient, applicable to all alloys, and operable on a 10-hour basis, but the actual performance and the possibilities as to size have yet to be determined.

Those rolling mills that can use one furnace for melting one alloy high in zinc 24 hours a day can gain the advantages of electric melting by using a furnace of the vertical-ring, induction type. A foundry making only red brass or bronze could use a direct or indirect arc type. If alloys containing up to about 20 per cent zinc are also to be melted, the direct-arc type would not serve, and if alloys still higher in zinc are to be melted, neither of these arc furnaces would serve, and the reflected-heat type might be used. Where continuous operation is not possible and the power cost is high, the lower thermal efficiency of this type would be a drawback. The eddy-current type may meet these conditions when it is developed, but for the moment there seems to be a gap not completely filled by any type of electric furnace that is immediately available. The rocking furnace developed and tested by the Bureau of Mines may perhaps help fill this gap.

HISTORY OF THE DEVELOPMENT OF THE ROOKING ELECTRIC FURNACE.

When the Bureau of Mines found, by its own tests and by the experience of others, that the direct and indirect-arc types of furnace used for steel were not suited for melting alloys high in zinc, some modification was sought that would partly or wholly remedy this limitation. As the indirect-arc type is already applicable to alloys higher in zinc content than the direct arc type is, it was obvious that attention should first be directed to the indirect type.

The high metal loss in the ordinary indirect-arc furnace is due to the fact that the source of heat, the arc, is above the metal, which is heated both by direct radiation from the arc and by heat reflected downward from the roof. The loss of zinc while the charge is melting is small, as the metal runs down through the charge to the bottom of the hearth. After the charge is molten, during the period of superheating to pouring temperature, there is little circulation within the melt, as hot metal is lighter than colder metal and tends to stay on top. If the rate of heat input is at all rapid, as is needful for thermal efficiency, heat is supplied to the surface of the molten metal faster than it is transmitted to the interior of the mass and a highly superheated surface layer results. Thus the top reaches the boiling point of zinc in yellow brass, while the bottom is scarcely above the melting point, and the average temperature of the bath is not high enough for satisfactory pouring. In brasses of 20 to 40 per cent zinc content, the boiling points are only 25 to 50° C. (50° to 100° F.) above the necessary pouring temperatures.*

If the furnace is not kept tightly closed, zinc vapor is continually lost. If the furnace is tightly sealed, pressure builds up within the furnace and may blow out the door or the roof at a weak point. Or, if the pressure is not relieved before the spout is opened for pouring, a long hissing stream of zinc vapor will shoot out, burning as it reaches the air. On account of the mechanical troubles due to this building up of pressure, and the loss of zinc, the indirect-arc furnace is not satisfactory for alloys high in zinc.

The obvious means of avoiding superheating of the surface layer, with its attendant troubles, is to stir the melt so vigorously that the temperature of the metal is practically uniform. This result might be accomplished by putting Hering resistor tubes or a vertical-ring induction loop below the melt, and utilizing the stirring action of this circuit to mix the metal. However, the use of two separate electrical circuits would be cumbersome.

* Gillett, H. W., Brass furnace practice in the United States, Bull. 73, Bureau of Mines, 1914, p. 129; Johnston, J., The volatility of the constituents of brass, Jour. Am. Inst. Metals, vol. 12, 1918, p. 15.

A mechanical stirring device might be used, such as has been suggested by Johnson,^a but great difficulty may be expected in maintaining such a device.

Stirring by the principle of the cement mixer seemed the most feasible method. Rotary fuel-fired furnaces are common, the rotary cement kiln being the most noteworthy example. Open-flame oil furnaces for brass melting are often rocked back and forth by hand during the last part of a heat to mix the charge and hasten melting. Very recently an open-flame oil furnace^b mechanically revolved during the process of melting has been placed on the market.

Various types of electric furnaces that may be rotated during part or all of the heat have been proposed. Carrere^c suggests a cylindrical furnace with non-rotatable ends, the body being rotated and heat being generated either in the walls or by a central arc.

Von Ischewsky^d shows a rotating furnace in which heat is generated in the walls of the furnace.

Thompson and Fitzgerald^e describe revolving furnaces in which heat is generated in a central resistor. Weeks^f and Imbert^g describe practically identical furnaces for zinc smelting. A central arc is used and the furnaces are capable of rotation during the melting, but the ends do not rotate.

The Stassano steel furnace^h may be, and some installationsⁱ have been, provided with a mechanism by which the furnace as a whole is oscillated by rotating about a slightly inclined vertical axis. This, however, will not produce as rapid mixing as seems desirable.

The Rennerfelt furnace may be, according to the patent,^j provided with a projection in the hearth designed to stir the charge when the furnace is rotated in one direction or the other. However, so far as is known, no Rennerfelt furnace has been so constructed, nor has systematic rocking of the furnace during melting been suggested.

On account of the way the electrodes must enter the furnace in the multiphase Stassano and Rennerfelt furnaces, complete rotation, or even oscillation, of the furnace is impracticable.

In order to prevent the roof getting hotter than the melt, with consequent reflection of heat from the roof in addition to radiation

^a Johnson, W. M., Process of making alloy castings, U. S. patent 1243416, Oct. 16, 1917.

^b Editorial, A noncrucible, revolving, tilting metal-melting furnace: *Metal Ind.*, vol. 16, 1917, p. 33.

^c Carrere, J. M., Electric furnace, U. S. patent 726860, May 5, 1903.

^d Von Ischewsky, B., Electric furnace, U. S. patent 847003, Mar. 12, 1907.

^e Thompson, J., and Fitzgerald, F. A. J., Electric furnace, U. S. patent 950678, Mar. 1, 1910. Thompson, J., Electric furnace, U. S. patent 950880, Mar. 1, 1910.

^f Weeks, C. A., Electric furnace, U. S. patent 949511, Aug. 6, 1912.

^g Imbert, A. H., German patent 219515, class 21b, group 8, Mar. 1, 1910.

^h Stassano, E., Electric furnace, U. S. patent No. 799106, Sept. 12, 1906; No. 1024657, Apr. 30, 1912; No. 1059499, Apr. 23, 1913; No. 1068494, Apr. 14, 1914; No. 1105859, Aug. 4, 1914.

ⁱ Lyon, D. A., and Keeney, R. M., Electric furnaces for making iron and steel, Bull. 67, Bureau of Mines, 1914, p. 82.

^j Rennerfelt, J., Electric furnace, U. S. patent 1076518, Oct. 21, 1913.

from the arc, the unwashed part of the roof should be as small as possible.

Hence a cylindrical furnace lying approximately horizontal with the electrodes entering at the ends seemed the most promising form, although on account of the limited space in the ends of any except a large furnace, of, say, 2-ton capacity, a single-phase arc is required and the electrical advantage of multiphase operation is lost.

Of the furnaces mentioned, only the Carrere and the Weeks come anywhere near meeting the conditions imposed. These both have stationary ends and a revolving body, a construction that involves many difficulties in maintaining a gas-tight seal over so large a joint, and in sealing the charging door to prevent leakage of metal when the furnace is revolved. The charging door, on account of lack of space on the ends, above the melt, must be placed on the circumference of the drum.

No account of any actual experiments with the Carrere furnace has been found in the literature. The Weeks zinc furnace, as has been previously stated, was tested by Hansen at the General Electric Co. plant at Schenectady, N. Y., for zinc smelting; also a couple of heats of copper were made in it. The patent specifications for the Weeks furnace make mention of revolving the body of the furnace to interchange the roof and hearth, the advantage being in "uniformly wearing the lining and applying substantially all the heat to the contents," but in a published description of the furnace Weeks ^a makes no mention of revolving the furnace or of the effect of stirring on metal losses. He assumes a figure for metal losses on yellow brass, but it is not based on any experiments.

Hansen, ^b in describing the Weeks zinc furnace, says:

The drum was mounted on rollers which could be motor driven. * * * The heat was supplied by radiation from an arc and the rotation of the furnace body was intended to equalize temperature of the furnace lining by periodically bringing all the parts of it in contact with the charge. Incidentally, thorough mixture of the charge would be secured by this rotation. The copper-melting experiments were of purely secondary consideration to Mr. Weeks * * *.

Hansen states ^c that in melting zinc with this furnace the electrodes become soldered in place by condensed zinc and could not be adjusted to regulate the arc. Mr. Weeks has informed one of the writers that the furnace, though designed to rotate, was not rotated in the copper-melting experiments. No experiments were made with brass, and the effect of stirring on the superheating of the surface of the melt and on loss of zinc was evidently not impressed on Hansen by the few experiments that were made, for, instead of continuing to experiment

^a Weeks, C. A., Melting nonferrous metals in an electric furnace: *Met. and Chem. Eng.*, vol. 9, 1911, p. 363.

^b Hansen, C. A., Electric melting of copper and brass: *Trans. Am. Inst. Metals*, vol. 6, 1912, p. 110.

^c Hansen, C. A., work quoted, p. 126.

with the Weeks furnace, Hansen built a three-phase Stassano-type furnace, which was tested on yellow brass borings at the Schenectady plant. Mr. E. L. Crosby, who witnessed the test, states that the pressure of zinc vapor was so high that the furnace could not be kept tight, and the metal loss was excessive. The experiments with that furnace were abandoned, and the present General Electric brass furnace, which does not provide for mechanical stirring, was designed.

Thus there was nothing in patent, or technical literature, on any known tests to show whether rocking an indirect arc furnace could be made to stir the metal sufficiently, or how such a furnace had best be constructed. Nothing had been done with the Weeks zinc furnace since the Schenectady tests in 1910, and, so far as known, no commercial firm was contemplating tests of such a type of furnace. Therefore, it was decided to construct and test a small-scale furnace of this type in the Bureau of Mines laboratory in order that no type that seemed, theoretically, at all feasible should be overlooked.

THEORETICAL ADVANTAGES OF A ROCKING FURNACE.

If the metal losses could be reduced enough below those of fuel-fired practice, the indirect-arc furnace would be promising, for it has many advantages, has been used commercially in steel making and for various other metallurgical purposes, and much is known about its behavior. There is more accumulated knowledge on this type of electric furnace than on any other, except the direct-arc furnace.

Indirect-arc furnaces, for a given power input, take higher voltages and lower currents than resistance or induction furnaces, and smaller transformers, leads, etc., can be used. The temperature is susceptible of considerable regulation by altering the length of the arc—that is, the arc can be regulated inside the furnace.

Such furnaces can be built and operated on a large scale, for 2-ton Stassano furnaces and 3-ton Rennerfelt furnaces are in use for melting steel. The question of size is highly important to rolling mills working on yellow brass, where, in general, 200-pound charges in crucible furnaces are used, although the output of the mills is tremendous. If the metal losses of large fuel-fired non-crucible furnaces did not overbalance their greater fuel economy and lower labor costs, the rolling mills would use the larger furnaces.

With a molten charge, the constant rotation of an indirect arc furnace should have the following advantages:

1. The charge would be thoroughly mixed and overheating of the surface prevented, thus giving a well-mixed alloy, desirable in brass melting, and preventing loss of zinc by sudden volatilization when the furnace is opened.

2. By washing the walls with the charge the heat that the walls have absorbed from the arc by radiation will largely be given up to

the metal, instead of passing out through the walls; that is, such a furnace should have a higher power efficiency than a stationary indirect-arc furnace tilted only to pour. Its efficiency should be higher than that of the reflected-heat type of resistor or smothered-arc furnaces, should probably be slightly higher than that of direct-arc furnaces, and should be second only to that of induction furnaces.

3. The walls, being washed by the molten bath, can not become much hotter than the metal itself; this helps to prolong the life of the lining and to lower the repair costs. With arc heating, the electrodes can be replaced at once with the furnace hot.

Cheaper refractories and those with a lower heat conductivity can be used than in furnaces where the roof or walls get very hot although the use of low-grade refractories will not, in the long run, be advisable.

EXPERIMENTS WITH LABORATORY ROCKING FURNACE.

CONSTRUCTION OF FURNACE.

An ether drum provided with two heavy hoops on which to roll it was used for the furnace shell. The diameter of the shell was not large enough to permit a proper thickness of lining, but it was thought that the furnace should give results for metal losses that would be representative, even though the power-consumption figures might not be. As metal loss is of first importance in determining whether such a furnace will be practicable for commercial work, the available equipment was deemed sufficient for the purpose without entailing much expense in building the furnace.

The furnace as constructed is shown in Plate I. The drum was 22 inches in outside diameter and 32 inches long. The ends were taken off and lined with 10 inches of ordinary fire brick, each end having a central hole 2 inches in diameter for the electrodes. The body of the furnace was lined with circular fire-clay tile 3 inches thick, set in fire clay, and coated inside with $\frac{1}{2}$ inch of No. 30 high-temperature asbestos cement. In later tests this $\frac{1}{2}$ -inch lining was replaced with $\frac{1}{4}$ inch of a mixture of fire clay and graphite, such as is used for making crucibles.

A charging hole and pouring spout 5 inches by 4 inches in size was made in the body of the furnace.

Three iron bars bolted to the ends of the shell on each side supported an electrode rest made of asbestos board, which insulated the electrode from the shell.

Graphite electrodes 2 inches in diameter and 40 inches long, when new, were used.

The leads were flexible cables provided with lugs which were clamped to flat places cut on the electrodes, to avoid the cost of

special holders. In later tests connection was made by passing flexible copper strips directly around the electrode and clamping them to it without cutting flat places. The electrodes were not water cooled in the first experiments.

Means for rotating the furnace was provided by making a double track from angle irons, along which the iron bands, or heavy, rail-like hoops, on the drum could roll. Spokes projected from each end of the furnace, with which it could be rolled by hand backward and forward along the track.

The track was set on brick piers. A long car, on which the ingot molds were set, ran on another track placed between the piers and beneath the elevated track for the furnace. In this way the melt could be poured directly into the molds. The furnace track took up so much room that pouring into a ladle and thence into molds would hardly have been possible in the small laboratory, because of all the other apparatus already in place in it. This pouring arrangement saved the trouble of preheating a ladle and eliminated much work in pouring.

The apparatus for rolling the furnace on the track by hand was cheaply constructed, whereas mounting on trunnions or on rollers would have been costly. The leads either lay along the floor on each side of the track or were suspended from above with enough slack in them to permit the furnace being rolled as far as desired. They were kept from touching the iron bars holding the electrode supports by the asbestos-board insulation on the bars.

The electrodes fitted quite tightly into the holes through the ends of the furnace, but could be adjusted by hand to start and control the arc. The fire-brick plug used for stopping the charging hole and pouring spout was held in place with an iron bar, which passed through loops fastened to the shell on either side of the hole. Each time after the door was opened the joint between the door and the spout was luted with fire clay. The voltage was 50 to 75 volts, and the current was 500 to 700 amperes, the usual power input being about 30 kilowatts. The power factor averaged 80 to 90, being above 85 during most of any heat.

TESTS ON RED AND YELLOW BRASS.

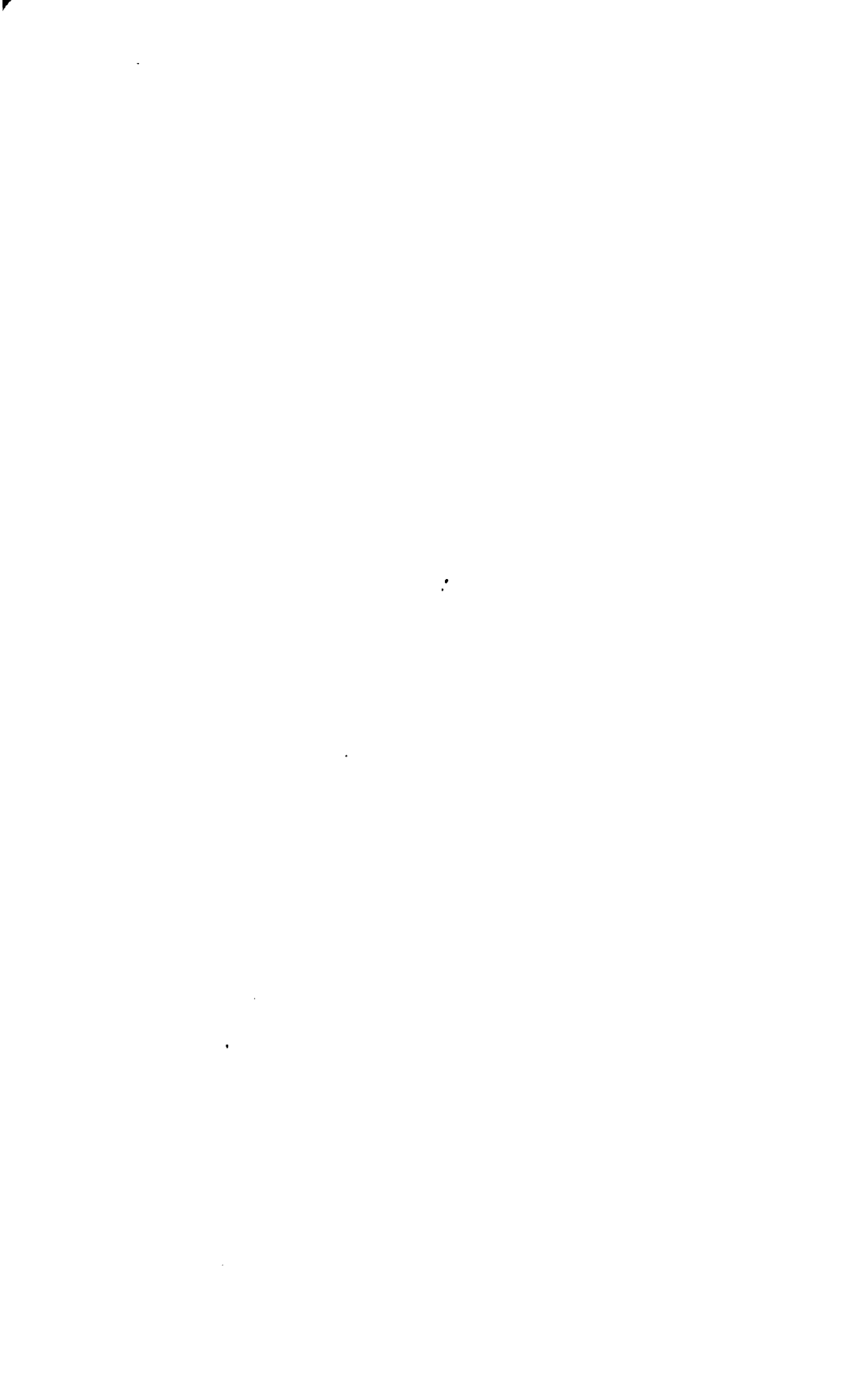
After the furnace had been thoroughly dried a series of melting tests were begun. The conditions of each individual test and the results obtained are set forth in the following pages. The numbers refer to the laboratory numbers of the tests.



A. LABORATORY ROCKING FURNACE, SIDE VIEW.



B. LABORATORY ROCKING FURNACE, END VIEW.



HEATS WITH INGOT METAL.

HEAT L1.

The cold furnace was preheated 40 minutes, 22 kilowatt-hours being used. Then 65.75 pounds of 2:1 yellow brass ingot was charged. The arc was then run 20 minutes, using 11.5 kilowatt-hours. The furnace was not rocked, as melting was not supposed to have begun. However, on opening the furnace, when the metal was at 1,075° C., zinc vapor shot out with a hissing sound, as from other stationary indirect-arc furnaces. There were recovered 58.6 pounds of ingot, and 3 pounds of metal from spillings and skimmings, or a total of 61.6 pounds. The net loss was 4.15 pounds or 6.45 per cent. Part of this loss was doubtless due to soakage into the new hearth.

HEAT L2.

Thirty-seven minutes after the arc was stopped on the previous heat, 55.4 pounds of ingot, containing about 25 per cent zinc, was charged and the arc started again. After the furnace had been heated 22 minutes without rocking, 6.4 pounds of zinc was added to the molten metal, in order to bring the composition up to that of 2:1 yellow brass, making a total charge of 61.8 pounds. It took 4 minutes to open the furnace, add the zinc, and lute the door. The arc was then run again for 5 minutes, with constant rocking of the furnace. The furnace was usually rocked at the rate of 5 or 6 complete swings a minute—a complete swing being from one extreme position of the furnace to the other extreme and back to the original position. Of course, the metal could not be allowed to run against the door, as it would either break through the luting and run out or else freeze in the joint and make opening of the door impossible. The metal covered, in its path, about three-quarters of the circumference of the furnace. During the whole run 12.5 kilowatt-hours was used. The metal was poured at 1,080° C. There was no indication of local overheating as in the first heat. There were recovered 59.7 pounds of ingot and 0.9 pound of shot, spillings, and skimmings, washed free from dirt and dross. Therefore the loss was 2.1 pounds or 3.5 per cent. As this was the first heat in which the furnace was rocked, some soakage into that part of the hearth not covered by the previous heat was to be expected.

HEAT L3.

The furnace had cooled 2½ hours after the preceding test. It was preheated 10 minutes, using 4.75 kilowatt-hours, then 60 pounds of 30 per cent zinc ingot was charged. After 13 minutes heating 3.6 pounds of zinc was added and the furnace was heated 8 minutes longer. In this run, and in all subsequent ones, rocking was begun before all the metal was melted, and continued all the time the arc

was on. When the charge was added in two or more parts, the rocking was begun, at the rate of about six complete cycles per minute, as soon as the metal first charged was expected to be partly melted, and kept up till the rest of the charge was put in; then as soon as the next charge had partly melted down, rocking was again begun and kept up thereafter. Including the 4.75 kilowatt-hours used in preheating the already slightly warm furnace, the total power consumption in this heat was 19 kilowatt-hours. The metal was poured at $1,100^{\circ}\text{C.}$; 61 pounds of ingot and 0.7 pound of shot were recovered, showing a loss of 1.3 pounds or 2.05 per cent.

HEAT L4.

The heat was started with 60.5 pounds of 30 per cent zinc ingot, 26 minutes after the arc was stopped on the preceding heat. After 18 minutes 3.1 pounds of zinc, to make the metal correspond to 2:1 yellow brass, was added, with a pound of common salt as flux. After heating for 4 minutes longer, the metal was at $1,090^{\circ}\text{C.}$, and was poured. Sixty-two pounds of ingot and 1 pound of shot were recovered, showing 0.95 per cent loss. The power consumption was 14.5 kilowatt-hours.

HEAT L5.

The furnace, started cold, was preheated 20 minutes, using 15 kilowatt-hours. Then 60.95 pounds of ingot was charged, and the furnace was heated 19 minutes, when 1.2 pounds of zinc and 1 pound of common salt were charged. Heating was continued 7 minutes, when 11 kilowatt-hours had been used, making a total of 26, including preheating. The metal was then at $1,105^{\circ}\text{C.}$, and was poured. There was recovered 60.3 pounds of ingot and no shot, hence the loss was 1.85 pounds, or 2.90 per cent.

HEAT L6.

In 20 minutes after the previous run, the furnace was charged with 62 pounds of ingot and started again. After 17 minutes heating, 0.6 pound of zinc and some salt were added and the arc was run 6 minutes more; then the metal was at $1,095^{\circ}\text{C.}$ and was poured. The total power consumption was 12.5 kilowatt-hours. In all, 61.8 pounds of ingot and 0.6 pound of shot were recovered. The total loss was 0.2 pound or 0.30 per cent.

HEAT L7.

After cooling $1\frac{1}{2}$ hours, the furnace was preheated 5 minutes, with a power consumption of 4 kilowatt-hours; then 60.3 pounds of ingot was charged, with 2 pounds of glass as flux. After 12 minutes the furnace was opened for 2 minutes to observe the charge. Then it was run at a lower power input for 12 minutes more, when 1.1 pound

of zinc was added. The temperature was found to be $1,100^{\circ}\text{C.}$, and the metal was poured. The power consumption, including that used in preheating, was 18 kilowatt-hours. Sixty pounds of ingot was recovered, and no shot. The glass stuck in the furnace and probably held some metal. The apparent loss was 1.4 pounds or 2.25 per cent.

HEAT 18.

After standing 18 minutes the furnace was started with 61.7 pounds of ingot in, and was run 15 minutes. Then 0.9 pound of zinc and 2 pounds of glass were added. Low power was used for 8 minutes, when the metal was at $1,090^{\circ}\text{C.}$ and was poured. This temperature is suitable for pouring 2:1 yellow brass, but was too low to melt the glass slag properly.

The power consumption in this heat was 14 kilowatt-hours, but in order to make the slag fluid enough to scrape out, 3 kilowatt-hours more was used.

The recovery was 60.75 pounds of ingot and 1.25 pounds of shot, and the apparent loss was 0.6 pound, or 0.75 per cent.

Excluding the first two heats, because of soakage into the new lining, the average loss of 2:1 yellow brass in these tests, based on the last six heats, is 1.6 per cent.

HEATS WITH MISCELLANEOUS SCRAP.

The next heats were on material loaned by the Hays Manufacturing Co., Erie, Pa., the charge being made up to correspond with one of its formulas. The ninth and tenth heats were intended to give metal like the Hays "yellow" brass, which contains about 25 per cent zinc. Those charges were made up from gates, fairly free from adhering sand; fairly clean scrap copper; dirty, oxidized shot recovered from ashes and spillings by concentration and called "kretz" by the Hays company, and of yellow-brass junk, which comprised old brass tubing, faucets, some being nickel-plated, old clock wheels, locks, etc. Pieces of wood, leather washers, and rubber packing, as well as much adhering grease and dirt, were found in this material. Its true metallic content was, of course, unascertainable.

HEAT 19.

The charge consisted of 10 pounds of "kretz," 6.6 pounds of yellow gates, 3.5 pounds of scrap copper, 46.7 pounds of yellow junk; total, 66.8 pounds (nominal, not true metallic weight).

After the cold furnace had been preheated 22 minutes, all the charge except about half the junk was put in, and in 8 minutes had melted enough so that the rest of the junk, with 1 pound of common salt and some charcoal, could be charged. The arc was then run 20 minutes, 14 kilowatt-hours being used, or 29 including preheating.

The metal was then at $1,060^{\circ}\text{C}$. and was poured. The melt was, however, a trifle cold and contained many chunks of porous, coke-like, laggy dross from the dirt in the junk and kretz.

A recovery of 63.3 pounds of ingot and 0.3 pound of shot was obtained. The apparent loss was 3.2 pounds of material, or 4.80 per cent, but all of this material was not metal.

HEAT LIO.

The charge used in this run was 10 pounds of "kretz," 6.6 pounds of yellow gates, 3.3 pounds of scrap copper, 46.7 pounds of yellow junk; total, 66.6 pounds. The furnace had stood about 22 minutes after the previous run. The current was started with all the charge in, except about half the junk. After 12 minutes the rest of the charge, with common salt and charcoal, was added. After 16 minutes' more heating the temperature was $1,060^{\circ}\text{C}$., which was not quite hot enough, so the heating was continued 4 minutes more, when the metal was at $1,090^{\circ}\text{C}$. and was poured. In this heat 17.75 kilowatt-hours was used. From the melt 63.9 pounds of ingot and 0.1 pound of shot were recovered, or 64 pounds in all; therefore the apparent loss was 2.6 pounds, or 3.80 per cent (not all metal).

HEAT LII.

After two hours, a heat designed to make red brass from a charge of Hays materials was started. The charge was 14.7 pounds of red gates, 25 pounds of scrap copper, 25 pounds of yellow chips (probably about 25 per cent zinc), 1.25 pounds of tin, 1.05 pounds of lead; total, 67 pounds. This mixture gives about 10 to 12 per cent zinc in the alloy.

The furnace was not preheated, but was slightly warm from the preceding test. The gates and most of the copper were put in and the arc run 22 minutes with a power consumption of 12.5 kilowatt-hours. Then the rest of the copper and the chips, with 2.5 pounds of glass and some charcoal, were added and the arc was run 15 minutes longer, 7.5 kilowatt-hours being used. The addition of the chips had frozen the charge and although they were melted at $1,090^{\circ}\text{C}$. all the copper and the gates had not melted, some being still solid in the bottom. After 2.5 kilowatt-hours had been put in for 7 minutes, the whole charge was melted and was at $1,045^{\circ}\text{C}$. Then 6.25 kilowatt-hours was put in in 9 minutes, when the temperature was $1,250^{\circ}\text{C}$. and the metal was poured. The glass was nicely fluid.

The whole heat took 28.75 kilowatt-hours. From this heat 66.1 pounds of ingot and 0.5 pound of shot were recovered, showing a loss based on the total charge, of 0.4 pound, or 0.60 per cent.

HEAT L12.

After 25 minutes, a run with a charge similar to that used in heat L11 was started. The charge consisted of 25 pounds of scrap copper, 25 pounds of yellow chips, 14.75 pounds of red gates, 1.15 pounds of lead, 1.4 pounds of tin; total, 67.3 pounds.

After 23 minutes, in which 11.5 kilowatt-hours was used, the balance of the charge, with glass and charcoal, was put in. After 18 minutes' further heating, in which 11.5 kilowatt-hours more was used, the temperature was found to be $1,305^{\circ}\text{C}$., which was too hot. Then 5.3 pounds of red gates was added, reducing the temperature to about $1,250^{\circ}\text{C}$., when the metal was poured. Thus 23 kilowatt-hours was used for 72.6 pounds of metal.

From this, 70.6 pounds of ingot and 0.3 pound of shot were recovered, giving an apparent loss of 1.6 pounds, or 2.20 per cent. The one-half inch thick asbestos cement lining was seen to have cracked off in a few places, being too thick to be elastic enough and too thin to hold up after cracking. Hence this asbestos lining was chipped out, and as a result 1.8 pounds of metal was recovered from behind the cracks. If this be credited to the last heat, the result shows an apparent gain. The bulk of this metal, however, should be credited to the last two heats, as before these the lining showed no visible cracks. The results of these two heats taken together then show a net loss of 0.2 pound on 139.6 pounds of metal, or 0.15 per cent.

Then a thin layer, not more than one-fourth inch, of a wash consisting of a mixture of fire clay and graphite, used for crucibles, was put in, and the furnace was dried out. After the furnace had cooled, a few tiny cracks appeared; these were patched.

HEAT L13.

In order to saturate the hearth, a heat was made of about 50 pounds of miscellaneous waste metal and slag. The charge was so dirty that a recovery of not more than 40 pounds was expected. The furnace, which had some moisture in it from the final patching, was dried and preheated for 25 minutes, using 13.5 kilowatt-hours, and then the whole 50 pounds of junk was charged. After 38 minutes' heating, using 14.5 kilowatt-hours, the contents were at $1,090^{\circ}\text{C}$. and were poured into ingot. Including the preheating, 28 kilowatt-hours was used, in all, and 43.6 pounds of ingot was recovered.

HEAT L14.

After 24 minutes another heat of 63 pounds of the ingot obtained in runs L9 and L10 was begun. All the metal, with salt and charcoal, was put in at the start.

After 23 minutes, in which 15.5 kilowatt-hours was used, the metal was at $1,170^{\circ}\text{C}$. As this was too hot for material with a 25 per cent zinc content, 3.5 pounds of yellow gates was added, bringing the temperature down to about $1,150^{\circ}\text{C}$. From this charge 66.1 pounds of ingot and 0.2 pound of shot were recovered, showing a loss of 0.2 pound, or 0.30 per cent.

HEAT L13.

The furnace, after standing 1 hour 10 minutes, was preheated for 10 minutes, using 5 kilowatt-hours, then all of a 64.2-pound charge of ingot from heats L9 and L10, with salt and charcoal, was put in. In 23 minutes, with a power consumption of 13.25 kilowatt-hours, the metal was at $1,190^{\circ}\text{C}$., or a little too hot, so 3.6 pounds of yellow gates was added, bringing the temperature down to about $1,150^{\circ}\text{C}$. A total of 18.25 kilowatt-hours was used for melting 67.8 pounds of metal. From this 67 pounds ingot and 0.3 pound of shot were recovered; thus the loss was 0.5 pound or 0.75 per cent. The average loss in heats L14 and L15 was about 0.5 per cent, whereas the average in L9 and L10, from dirty junk, was about 4.4 per cent. This indicates that the bulk of the loss in heats L9 and L10 was dirt, not metal.

HEAT L16.

After 16 minutes a heat of Hays yellow chips, containing about 25 per cent zinc, was begun. The whole charge of 50 pounds (no allowance being made for oil or dirt, some of both being present) with salt and charcoal was put in. In 20 minutes, using 11.75 kilowatt-hours, the metal was at $1,230^{\circ}\text{C}$., or much too hot, and was "jumping" noticeably, so 4.9 pounds of yellow gates was added. This reduced the temperature to about $1,150^{\circ}\text{C}$. From the 54.9-pound charge 53.75 pounds of ingot and 0.15 pound of shot were recovered, showing a loss of 1 pound, or 2 per cent, which is well below the results obtained in practice with fuel-fired furnaces.

HEAT L17.

After 17 minutes, a charge of 50 pounds of Hays red chips, which are about 10 per cent zinc, was put in with charcoal and heated in 18 minutes, using 12 kilowatt-hours, to $1,240^{\circ}\text{C}$., which was too hot. Then 4.15 pounds red gates was added, reducing the temperature to about $1,200^{\circ}\text{C}$. No allowance was made for oil or dirt, and a little oil was present. From the 54.15 pounds charged, 52.2 pounds of ingot and 0.4 pound of shot were recovered, hence the loss was 0.55 pound or 1 per cent.

HEAT L18.

In heat L18, power consumption and metal losses were secondary, as the heat was run for the purpose of testing pyrometers for brass in molten metal at high temperatures. This meant holding the metal in the furnace a long time and having the door open a great deal.

The furnace was first preheated 8 minutes, using 5 kilowatt-hours, then some very bulky red brass gates were charged, the power being off 12 minutes. Then the arc was run 25 minutes, using 8.5 kilowatt-hours, and more gates were charged. After being off 5 minutes the arc was run 16 minutes, using 11 kilowatt-hours. After another 5-minute period in which the rest of the 67-pound charge of gates was put in, the arc was run 7 minutes, using 5.5 kilowatt-hours, when the temperature was $1,000^{\circ}\text{C}$. After being off for 8 minutes, the arc was run 10 minutes, using 6 kilowatt-hours, when the temperature was $1,200^{\circ}\text{C}$. In the whole heat, including preheating, 35 kilowatt-hours was used, starting with a cold furnace. The pyrometer tests were then started, the door being open most of the time, while the power was off. After 18 minutes 5 kilowatt-hours more was used in 8 minutes. The temperature was then $1,215^{\circ}\text{C}$. After 13 minutes 4 kilowatt-hours was put in in 5 minutes, but so much heat had been lost in the 13 minutes the power was off and the door open that the temperature was only $1,160^{\circ}\text{C}$.

The power was only off 5 minutes after this, and 4 kilowatt-hours in 8 minutes gave a temperature of $1,280^{\circ}\text{C}$. The furnace was then left open till the temperature had fallen to about $1,200^{\circ}\text{C}$., when the metal was poured.

The door was open a good deal while the metal was at $1,160^{\circ}$ to $1,280^{\circ}\text{C}$. Yet the metal loss was only 0.5 pound or 0.75 per cent, as 66.1 pounds of ingot and 0.4 pound of shot were recovered.

HEAT L19.

In heats L19 to L22, inclusive, the charge was 70 pounds of scrap yellow brass, 10 pounds of yellow gates, 5 pounds of scrap copper, and 15 pounds of "kretz." The aim was to make a yellow brass containing about 25 per cent zinc. In addition to the metal, 2 pounds of salt and a double handful of charcoal were used on each heat.

Heat L19 began at 8 a. m. in a cold furnace with all the charge in the furnace at the start, save about 30 pounds of scrap. After 30 minutes, when 19 kilowatt-hours had been used, rocking was started. At 8.34, when 21.6 kilowatt-hours had been used, the rest of the charge was put in and the salt added. The arc was off 5 minutes, till 8.39. At 8.45 rocking was again begun and at 8.58, when 32 kilowatt-hours had been used, the temperature was $1,115^{\circ}\text{C}$. This

was a little cold, so after 3 minutes had been spent in opening the door, taking the temperature, and closing and luting the door, the arc was started again and run till 9.08, when 35 kilowatt-hours had been used, and the metal was at $1,145^{\circ}\text{C}$. and was poured.

From the 100-pound charge 93.5 pounds of ingot and 2 pounds of shot, 95.5 pounds in all, were recovered, giving an apparent loss of 4.5 per cent.

HEAT L20.

At 9.23, with all the charge in except about 40 pounds of scrap, the arc was started. At 9.51, when 12.7 kilowatt-hours had been used, the rest of the charge and the salt were put in. After 6 minutes the arc was started again and run till 10.21, when 24.2 kilowatt-hours had been used and the metal was at $1,145^{\circ}\text{C}$. From this run 95.15 pounds of ingot and 0.7 pound of shot, or 95.85 pounds in all, were recovered, giving an apparent loss of 4.15 per cent.

HEAT L21.

Heat L21 was started at 10.37 a. m. with all the metal, except 40 pounds of scrap, in the furnace. At 10.59, when 10 kilowatt-hours had been used, the rest of the metal and the salt were charged and the arc was started after being off 5 minutes. At 10.27, when 21 kilowatt-hours had been used, the temperature was over $1,200^{\circ}\text{C}$. and 5.3 pounds of gates was added to bring the temperature down to about $1,175^{\circ}\text{C}$. before pouring. There were recovered 100.9 pounds of ingot and 0.7 pound of shot, or 101.6 pounds in all, giving an apparent loss of 3.55 per cent.

HEAT L22.

At 11.40 a. m. all the charge except 40 pounds of scrap was put in and left without running the arc till 12.37, when the arc was started. At 1 p. m., when 7 kilowatt-hours had been used, the rest of the charge and the salt were put in and at 1.04 the arc started again and run till 1.27, when 18 kilowatt-hours had been used. The temperature was found to be $1,050^{\circ}\text{C}$. After a 4-minute stop the arc was run till 1.38, when 21 kilowatt-hours had been used, and the metal was at $1,135^{\circ}\text{C}$. As a result, 95.15 pounds of ingot and 1.1 pound of shot, or 96.25 pounds in all, were poured, giving an apparent loss of 3.75 per cent.

HEAT L23.

The next heat was on the dirty "kretz" alone. Fifty pounds of this material, with some charcoal, was put in at the start, at 2.01 p. m., and was heated 37 minutes, when 15 kilowatt-hours had been used and the temperature was $1,210^{\circ}\text{C}$.

From this run 40.2 pounds of ingot and 1.1 pounds of shot, or 41.3 pounds in all, were recovered, showing a loss of 17.4 per cent. The amount of slag was large.

It is evident that not more than 85 per cent of the "kretz" is metallic material. On this basis 15 pounds of "kretz" used in a 100-pound charge of yellow brass would contain 2.25 pounds of non-metallic material. H. H. Clemens, of the Hays Manufacturing Co., stated that there was about one-half pound of dirt on the 70 pounds of yellow brass scrap used for each 100-pound charge. The nonmetallic content from these two sources is then at least 2.75 per cent.

The losses on heats L9, L10, and L19 to L22, inclusive, may be corrected as follows:

Losses in heats L9, L10, and L19 to L22, corrected for nonmetallic material.

Heat.	Apparent loss (based on weight of charge).	Real loss (based on metal content of charge).
	<i>Per cent.</i>	<i>Per cent.</i>
9.....	4.40	2.06
10.....	3.90	1.15
19.....	4.60	1.75
20.....	4.15	1.40
21.....	3.55	.80
22.....	3.75	1.00
Average.....	4.10	1.35

HEAT L24.

At 8.30 a. m. a heat aimed to produce 2:1 yellow brass was begun with a charge of 37.8 pounds of 2:1 yellow-brass ingot and 43.2 pounds of ingot copper in the cold furnace. At 9:11 a. m., after 28 kilowatt-hours had been used, 22.05 pounds of zinc was added. The arc was started again at 9.16 and run till 9.24, using in all 30.5 kilowatt-hours, when the temperature was 1,075° C. In this run 101 pounds of ingot and 1.3 pounds of shot, or 102.3 pounds in all, were recovered, thus the loss was 0.75 pound, or slightly less than 0.75 per cent.

HEAT L25.

Heat L25 was on a red-brass composition containing about 10 per cent zinc. The original charge was 37.5 pounds of scrap copper, 21.5 pounds of red gates, 37.5 pounds of yellow (25 per cent zinc) chips, 1.75 pounds of lead, and 1.85 pounds of tin; total weight, 100.10 pounds.

Most of the copper and gates were put in at the start at 9.42 a. m., and at 10.05 a. m. after 12 kilowatt-hours had been used, the rest of the charge, with charcoal and no flux, was put in. After 6 minutes the arc was started again and run till 10.32 a. m., when 25 kilowatt-hours had been used. The temperature was 1,230° C., which was too hot, so 6 pounds of red gates was added, reducing it to about 1,200° C.

TABLE I.—Results of 28 heats in laboratory electric rocking brass furnaces.

Heat (Lab. No.).	Composition aimed at in melt.	Kind of material charged.	Weight of ma- terial charged.	Flux.	Condition of furnace at start.	Ingot poured.	Shot poured.	Total metal recov- ery.	Net loss of metal.	Tem- perature of pour- ing.	Total power con- sump- tion.	Power con- sump- tion per hundred pounds of metal.
L1.....	Yellow brass (21).....	"21" yellow ingot.....	Pounds. 66.75	None.....	Cold b.....	Pounds. 58.6	Pounds. 3.0	Pounds. 61.6	Per ct. 6.45	° C. 1,075	Kw. hrs. 33.5	Kw. hrs. 51
L2.....	do.....	"25 per cent zinc" ingot (55.4 pounds) and metallic zinc (6.4 pounds).....	61.8	do.....	Hot c.....	59.7	.9	60.6	3.5	1,080	12.5	20.75
L3.....	do.....	"50 per cent zinc" ingot (60) and zinc (3.6).....	63.6	do.....	Nearly cold.....	(1.0)	.7	61.7	2.05	1,100	19	30
L4.....	do.....	"30 per cent zinc" ingot (60.5) and metallic zinc (3.1).....	63.6	Common salt.....	Hot.....	62.0	1.0	63.0	.95	1,080	14.5	23
L5.....	do.....	"30 per cent zinc" ingot (60.5) and metallic zinc (3.1).....	62.15	do.....	Cold.....	60.3	None.	60.3	2.90	1,105	26	45
L6.....	do.....	Ingot (62) and zinc (0.6).....	62.6	do.....	Hot.....	61.8	.6	62.4	.30	1,095	12.5	20
L7.....	do.....	Ingot (60.3) and zinc (1.1).....	61.4	Glass.....	Warm.....	60.0	None.	60.0	2.25	1,100	18	29.5
L8.....	do.....	Ingot (61.7) and zinc (0.9).....	62.6	do.....	Hot.....	60.75	1.25	62.0	.95	1,090	14	22.5
L9.....	Yellow brass (25± per cent zinc).	Yellow "junk" (46.7), "kretz" (10), yellow gates (6.6), and scrap cop- per (3.5).....	66.8	Salt.....	Cold.....	63.3	.3	63.6	{ \$ 4.80 / 2.05 }	1,090	29	42.5
L10.....	do.....	Yellow "junk" (46.7), "kretz" (10), yellow gates (6.6), and scrap cop- per (3.3).....	66.6	do.....	Hot.....	63.9	.01	64.0	{ \$ 2.90 / 1.15 }	1,090	17.75	26.5
L11.....	do.....	Red gates (14.7), yellow chips (25), scrap copper (25), tin (1.25), and lead (1.05).....	67.0	Glass.....	Slightly warm.....	64.1	.5	64.6	.00	1,250	28.75	43
L12.....	do.....	Red gates (20.05), yellow chips (25), scrap copper (25), tin (1.4), and lead (1.15).....	72.6	do.....	Hot.....	70.7	{ .3 1.8 }	71.0 from lining	b 2.20	1,250	23	31.5
L13.....	Indeterminate.....	Dirty waste.....	139.6 \$ 50.0	Salt.....	Cold.....	136.8 (43.6)	2.6	139.4	.20	1,090	26	63.5
L14.....	Yellow brass (25± per cent zinc).	"25 per cent" ingot from heats L9 and L10 (63) and yellow gates (3.5).....	66.5	do.....	Hot.....	66.6	.2	66.3	.30	1,150	15.5	24.5
L15.....	do.....	"25 per cent" ingot from heats L9 and L10 (64.2) and yellow gates (3.6).....	67.8	do.....	Warm.....	67.0	.3	67.3	.75	1,160	18.5	28.5

L16.....	do.....	Yellow "26 per cent" chips (50) and yellow gates (4.9).	54.9	do.....	Hot.....	83.75	.15	53.9	2.0	1,150	11.75	24.5
L17.....	Red brass (10± per cent time).	Red chips (50) and red gates (4.15).....	54.15	None.....	do.....	53.2	.4	53.6	1.0	1,200	12	24
L18.....	do.....	Red gates.....	67.0	do.....	Cold.....	66.1	.4	66.5	.75	1,200	35	33
L19.....	Yellow brass (25± per cent time).	Yellow "junk" (70), yellow gates (10), "Krets" (15), and scrap copper (5).	100.0	Common salt.....	do.....	93.5	2.0	94.5	{ d 4.5 / 1.75	1,145	35	35
L20.....	do.....	Same as in L19.....	100.0	do.....	Hot.....	91.15	.7	95.85	{ d 4.15 / 1.40	1,145	24.2	24.2
L21.....	do.....	Same as in L19, plus (5.3) of gates.....	105.3	do.....	do.....	100.9	.7	101.6	{ d 3.55 / .89	1,175	21	20
L22.....	do.....	Same as in L19.....	100.0	do.....	do.....	95.15	1.1	96.25	{ d 3.75 / 1.00	1,135	21	21
L23.....	Indeterminate.....	"Krets".....	50.9	None.....	do.....	40.2	1.1	41.3	{ d 17.4	1,210	15	30
L24.....	Yellow brass (2:1).....	2:1 brass ingot (37.5) and copper ingot (43.2).	103.5	do.....	Cold.....	101.0	1.3	102.3	.75	1,075	30.5	30
L25.....	Red brass (10± per cent time).	Red gates (21.5), yellow chips (37.5), scrap copper (37.5), lead (1.75), and tin (1.85).	104.15	do.....	Hot.....	104.95	.70	105.65	.50	1,200	25	23.6
L26.....	do.....	Red gates (21.5), yellow chips (37.5), scrap copper (37.5), lead (2.5), and tin (2).	107.3	do.....	do.....	106.0	.7	106.7	.55	1,200	21.2	20
L27.....	Yellow brass (25± per cent time).	Yellow chips.....	100.0	Common salt.....	do.....	98.2	.7	98.9	1.1	1,100	21	21
L28.....	Red brass (10± per cent time).	Red chips.....	49.85	None.....	do.....	48.7	.65	49.35	1.00	1,200	12	24

a Figures in parentheses refer to weight of material in pounds.

b New hearth; furnaces not rocked.

c Furnace rocked only after speltering; bath in contact with new lining.

d Apparent loss, based on weight of material charged.

e Temperature was too cold for good pouring.

f Actual loss, based on estimated weight of metallic material in charge.

g Includes dirt.

h Held in furnace one hour before pouring.

i Furnace was charged while hot from previous run, then stood about one hour before current was turned on.

The total weight of the metallic materials charged was 106.1 pounds. From this 104.95 pounds of ingot and 0.70 pound of shot, or 105.65 pounds in all, were recovered, showing a loss of 0.45 pound or slightly less than 0.45 per cent.

HEAT L26.

Heat L26 was on a red-brass composition similar to that used in heat L25. The original charge was 37.5 pounds of scrap copper, 21.5 pounds of red gates, 37.5 pounds of yellow chips, 2.0 pounds of tin, and 2.5 pounds of lead, total 101.0 pounds. Most of the scrap and gates were put in at the start, at 10.40 a. m. At 11.08 a. m., when 8 kilowatt-hours had been used, the rest of the charge, with some charcoal, was put in. After 6 minutes, the arc was started again and run till 11.35 a. m. when 21.2 kilowatt-hours had been used. The temperature was 1,240° C., so 6.3 pounds of red gates was added, lowering it to about 1,200° C.

The total charge was 107.3 pounds; 106.0 pounds of ingot and 0.7 pound of shot, or 106.7 pounds in all, were poured, showing a loss of 0.6 pound or about 0.55 per cent.

HEAT L27

At 11.45 a. m. about 60 pounds of a heat of 100 pounds of yellow chips (25 per cent zinc) was put into the furnace, and left till 12.32 p. m., when the arc was started. At 12.45, when 8.3 kilowatt-hours had been used, the rest of the charge, with some common salt and charcoal, was added. After being off 6 minutes, the arc was run for 19 minutes, when 18 kilowatt-hours had been used. The temperature was only 1,040° C. After a 4-minute interval the arc was run again for 6 minutes, till 1.20 p. m., when 21 kilowatt-hours had been used and the temperature was 1,100° C.

There were poured 98.2 pounds of ingot and 0.7 pounds of shot, or 98.9 pounds in all were recovered, with a loss of 1.1 pounds, or 1.1 per cent.

HEAT L28.

Heat L28, on 49.85 pounds of red brass chips with a zinc content of 10 per cent, was started at 1.35 p. m. with all the charge, including charcoal, in the furnace. The arc was run until 2.01 p. m., when 12 kilowatt-hours had been used and the temperature was 1,200° C.

In this heat 48.70 pounds of ingot and 0.65 pound of shot, 49.35 pounds in all, were recovered, indicating a loss of 0.5 pound or about 1 per cent.

SUMMARY OF RESULTS OF THE 28 HEATS.

The results of the 28 heats are summarized in Table 1.

The data for metal losses, the first two heats being omitted because the furnace was not properly rocked, are as follows:

TABLE 2.—Summary of data on metal losses in 24 heats.

2:1 YELLOW BRASS.

Heat No.	Material used.	Pouring temperature, °C.	Apparent loss.	Net loss.
			<i>Per cent.</i>	<i>Per cent.</i>
L3.....	Yellow brass ingot and a little zinc.....	1,100		2.05
L4.....	do.....	1,090		.95
L5.....	do.....	1,105		2.90
L6.....	do.....	1,065		.30
L7.....	do.....	1,100		2.25
L8.....	do.....	1,090		.95
L24.....	Yellow brass ingot, copper, much zinc.....	1,075		.75
Average.....				1.5

YELLOW BRASS (25± PER CENT ZINC).

L9.....	Scrap, gates, "kretz," lead, and tin.....	1,060	4.80	2.05
L10.....	do.....	1,090	3.90	1.15
L19.....	do.....	1,145	4.50	1.75
L20.....	do.....	1,145	4.15	1.40
L21.....	do.....	1,177	3.55	.80
L22.....	do.....	1,135	3.75	1.80
Average.....			4.10	1.35
L14.....	Ingot from heats L9 and L10.....	1,150		.30
L15.....	do.....	1,150		.75
Average.....				.50
L16.....	Chips.....	1,150		2.00
L27.....	do.....	1,100		1.10
Average.....				1.63

RED BRASS (10 PER CENT ZINC.)

L11.....	Scrap copper, 25 per cent zinc yellow chips, gates, lead, and tin.....	1,250		0.80
L12.....	do.....	1,250		.20
L25.....	do.....	1,200		.60
L26.....	do.....	1,200		.55
Average.....				.50
L13.....	Gates.....	1,200		.75
L17.....	Chips.....	1,200		1.00
L18.....	do.....	1,200		1.00
Average.....				1.00

a Melt held in furnace 1 hour before pouring.

TESTS ON CONCENTRATES FROM BRASS-FURNACE ASHES.

The concentrates from brass-furnace ashes are usually sent to a smelter where the copper only is recovered. If the other metals could be recovered also, the increased recovery might pay for electric melting.

Some concentrate of about 20-mesh fineness was loaned the Bureau of Mines by W. S. Rowland, of the Connecticut Metal & Chemical Co., for testing in the rocking furnace. The composition of this

material was, according to an analysis supplied by Mr. Rowland, as follows:

Composition of brass-furnace concentrate tested.

	Per cent.
Copper.....	71.0
Zinc.....	14.3
Iron.....	a 2.2
Lead.....	None.
Tin.....	None.
Insoluble.....	7.2

HEAT L29, L30, AND L33.

All the charge, 75 pounds of concentrate, with 0.4 pound of 4-mesh charcoal, was put into the cold furnace at the start, heated 68 minutes, using 38.25 kilowatt-hours, and was poured at 1,240° C.

In all, 43.6 pounds of ingot and 7.75 pounds of slag were poured. The slag poured was fairly fluid, but much slag stuck in the furnace and could not be scraped out.

In run L30, 75 pounds of concentrate, 0.5 pound of 10-mesh charcoal, and 1 pound lime (partly air-slaked), were charged into the hot furnace. After 25 minutes, when 13.5 kilowatt-hours had been used, the temperature was 1,100° C, and 39.3 pounds of ingot and 8 pounds of slag were poured. Heating was then continued 15 minutes, using 9.5 kilowatt-hours, when the metal was at 1,240° C.; 15.1 pounds of ingot and 9 pounds of slag were poured. Then heating was continued 8 minutes, using 5.5 kilowatt-hours, and 2.7 pounds of ingot and 2 pounds of slag were poured. The total power consumption was 28.5 kilowatt-hours. As some of the slag still stuck in the furnace, the latter was allowed to cool, and the slag was chiseled out. One chunk of caked material, weighing 12.2 pounds, evidently from heat L29, was found in the bottom, covered with slag. Evidently a viscous slag had formed over this mass and prevented the tiny buttons from coalescing. In cleaning the furnace 13.5 pounds of slag, buttons, and pieces of lining were taken out.

The furnace was then clean and practically free from slag or shot. The slag from heats L29 and L30 and the mixed slag, lining, etc., that had been chiseled out was crushed in a jaw crusher. This crushed material was freed from the larger pieces of slag by panning in a stream of water.

After the next two heats, L31 and L32, were over, this material was melted. This "concentrate" and the matted pieces plus the spillings from heats L29 and L30 weighed 24.5 pounds. This material, with 4 pounds of salt, a handful of charcoal, and 1 pound of lime, was charged into the hot furnace.

^a Iron content is high, as the material has not been properly treated with magnetic separator.

The heat (No. L33) continued 17 minutes, and used 10 kilowatt-hours. The temperature was not taken, but was about $1,200^{\circ}\text{C}$. When the furnace was poured, 14.8 pounds of ingot and spillings and 6.5 pounds of slag were obtained, and 0.5 pound of shot was recovered from the slag. The slag was not homogeneous, although the salt floated off the stony particles of thick slag and lining in the "concentrate" fairly well.

The total concentrate charged for these three heats was 150 pounds. The recovery of ingot was lot 1, 43.6 pounds; lot 2, 39.3 pounds; lot 3, 15.1 pounds; lot 4, 2.7 pounds; lot 5, 14.8 pounds; and of shot, 0.5 pound, making a total of 116 pounds, or 77.4 per cent of the concentrate charged.

The 150 pounds of concentrate contained 106.5 pounds of copper and 21.5 pounds of zinc. Thus in these heats all the copper and about half the zinc were recovered. The slag was too viscous in all three of the runs. The slag in heat L30 was less viscous than in heat L29, but still too thick. When the furnace had been patched after being chiseled out, a heat was made with an increased proportion of lime.

HEATS L31 AND L32.

In heat L31, 63.15 pounds of concentrate, 1.5 pounds unslaked lime (CaO) and 0.3 pound 10-mesh charcoal were charged into the cold furnace, and the arc run 46 minutes, using 32.5 kilowatt-hours. The temperature was 1260°C . The metal and the slag were poured together into ingot molds, and when the mass had frozen, the slag was knocked off. From this melt 49.6 pounds of ingot and 12 pounds of slag were obtained. A little slag clung to the lining, but the slag was nicely fluid and the metal separated well, only 0.1 pound shot and spillings being obtained. Thus the total recovery was 61.7 pounds.

In the next heat (L32) 64 pounds of concentrate, 1.5 pounds of lime, 0.5 pound of fluorspar, and 0.4 pound of charcoal were charged into the hot furnace. After 31 minutes, when 20 kilowatt-hours had been used, the temperature was $1,235^{\circ}\text{C}$. The slag was nicely fluid, but not more so than without the fluorspar. The slag and the metal were poured together into the molds. In all, 49.3 pounds of ingot and 14 pounds of slag were poured, and 0.1 pound of shot and spillings was recovered, making a total recovery of 63.4 pounds.

In these two heats 127.15 pounds of concentrates was charged, corresponding to 90.3 pounds of copper and 18.2 pounds of zinc. The total recovery was 99.1 pounds or 78 per cent of the charge, or roughly, all the copper and half of the zinc were recovered. Hence a ton of this concentrate should give 1,560 pounds of metal containing 1,420 pounds of copper and 140 pounds of zinc.

Analyses of the ingot obtained in this melt showed that the recovery of copper from the original concentrate was more than 99 per cent. The exact figures were lost in a fire that destroyed the Bureau of Mines office in Morse Hall, Cornell University, after these tests were completed.

Lyon and Keeney^a state that 600 calories per kg. of slag and 204 calories per kg. of metal were required for melting and superheating copper concentrates in an electric furnace. Hence it was thought that the presence of the slag would greatly increase the power consumption over that of melting metal free from slag.

However, in heat L32, a second heat with the furnace warm, 20 kilowatt-hours was used in heating 66.4 pounds of concentrate, or 30 kilowatt-hours per 100 pounds, to 1,235° C., in heat L10, also a second heat, 72.6 pounds of metal was heated to 1,250° C. with a power consumption of 23 kilowatt-hours, or 31.5 kilowatt-hours per hundredweight.

Hence it seems probable that in melting such material the power consumption would not be much larger than with metal.

POWER-CONSUMPTION TESTS.

The tests recorded in the preceding paragraphs were made on charges not so large as the furnace would take, so a series of heats were made with 128-pound charges, to get some idea of the power consumption.

In the next five tests the charge consisted of about 94 pounds of red and yellow ingot and 33 pounds of scrap copper, being designed to give a red brass containing 81.5 per cent copper, 8.5 per cent zinc, 6 per cent lead, and 4 per cent tin. In each test the whole charge was put into the furnace at the start, no further opening of the furnace being necessary.

The furnace was cold at the start. The power was off during pouring. The total time required for the five heats, including charging and pouring, was five hours. The average time between stopping the arc on one heat and starting it on the next was 18 minutes. This period was used in taking the temperature, pouring, charging, and sealing the door with fire clay.

In all of these heats rocking was begun when about half the power consumption for any given heat had been used. The results of the run follow:

^a Lyon, D. A. and Keeney, R. M., The smelting of copper ores in the electric furnace: Bull. 81, Bureau of Mines, 1915, p. 34.

Results of heats to determine power consumption.

Heat No.	Weight of charge, pounds.	Time arc was on, minutes.	Pouring temperature, °C.	Average power input; kw.-hours.	Number of kw.-hours used.	Power consumption, kw.-hours per 100 pounds of metallic material charged.
34.....	127.3	57	1,140	40	39	30.5
35.....	127.75	50	1,180	36.5	30.5	25
36.....	128.5	50	1,220	32	28.5	20.5
37.....	126.5	37	1,220	36.5	22.5	17.75
38.....	129.5	36	1,220	32	19	14.75
Total or average.....	639.55	46	1,200	36	136.5	21.5

As regards metal losses, 630.9 pounds of ingot was poured, giving a gross loss of 8.65 pounds, or 1.35 per cent, and 7.45 pounds of metal from spillings, skimmings, and buttons left in the furnace was recovered. Thus the total recovery was 638.35 pounds, giving a net metal loss of 1.2 pounds, or 0.19 per cent.

During these five heats the weight of electrodes consumed was 1 pound.

The power consumption, which was at the rate of 430 kilowatt-hours per ton on a five-hour run, starting with the furnace cold, and at the rate of 295 kilowatt-hours per ton when the furnace is hot, on metal heated to 1,200° C., is surprisingly low for so small a furnace.

TESTS ON MANGANESE-BRONZE BORINGS.

The next test was on manganese-bronze borings, the main object being the determination of the metal losses. Through the kindness of Mr. V. Skillman, of the Lumen Bearing Co., about 350 pounds of borings was obtained from that company. This manganese bronze was originally made up to have a composition as follows: Copper, 58 per cent; zinc, 40.5 per cent; tin, 0.3 per cent; aluminum, 0.4 per cent; iron, 1.5 per cent; and a trace of manganese.

This lot of borings was very oily and contained many iron or steel turnings, as well as a little paper and sweepings. From 350.1 pounds, 0.45 pound of large iron borings, nuts, etc., was picked out by hand, leaving 349.65 pounds.

The oil content, determined by extraction with ether, was found to be 1.4 per cent, corresponding to 4.9 pounds.

There was probably a small amount of 2:1 yellow brass borings mixed with the manganese bronze, but not enough to alter materially the behavior of the borings as to metal loss.

HEAT L39.

The first heat (heat L39) of the series was started with 71.75 pounds of borings in the furnace. After 10 minutes, when 7.75 kilowatt-hours had been used, rocking was started, and after six minutes more—power input 3.75 kilowatt-hours—the rest of the charge, 48.25 pounds of borings, with 1.5 pounds of common salt and a little charcoal, was put in. The arc was off for nine minutes while the charge was being added and the door luted. Five minutes after the current was turned on, rocking was again begun and was continued for 24 minutes, when the door blew loose, zinc vapor shooting out all around it with a loud hissing sound. This indicated either too high a temperature of the bath, or local overheating. The temperature of the bath was found to be 1,050° C., which was too high, and the melt was “jumping” strongly. The metal was then poured.

No fluid slag was formed, although sodium chloride had been added for flux, but there was a fine, powdery dross, which was black, and contained much soot that could be floated off with water, tiny globules of manganese bronze, and much iron borings. A good deal of this dross stuck to the furnace walls, the melted sodium chloride evidently acting as a binder. The furnace was thoroughly scraped, but not much of the adhering dross could be removed. It seems possible that the soot formed from the decomposition of the oil helped to envelope the tiny globules of metal and to prevent them from coalescing.

From this melt 105.35 pounds of ingot and 1 pound of spillings were obtained, or 106.35 pounds of good metal. There was 0.2 pound of manganese-bronze shot and iron borings coarser than 14 mesh in the dross skimmed off, and 1.9 pounds of fine dross under 14-mesh.

The total time from the starting of the arc, exclusive of that for charging the cold furnace, was 54 minutes, during which the arc was on 45 minutes. The total power consumption was 32 kilowatt-hours in all, or 26.6 kilowatt-hours per 100 pounds of metallic material charged. The average power input was 41 kilowatts.

HEAT L40.

The arc was off 22 minutes between heats, this time being used in taking the temperature, pouring the melt, scraping the furnace, charging 71.55 pounds of borings, and luting the door. After 3.5 kilowatt-hours had been used rocking was started; then, after the arc had been on 15 minutes and 10 kilowatt-hours had been used, 48.55 pounds borings, 1.5 pounds of salt, and some charcoal were added. The arc was off 6 minutes for charging. The door was not luted

tight at this time. After 3 minutes, when the oil had ceased to smoke and a small zinc flame came out instead of the smoky oil flame, the door was tightly luted and rocking was started again. The arc was run 24 minutes after the second part of the charge was in, 14.5 kilowatt-hours being used in this period.

The door did not blow loose, but when it was opened there was a marked outrush of zinc vapor, although not so violent as in heat L39. The temperature was 1,040° C.

The "jump" was strong, although not so strong as in the preceding test. Again there was no fluid slag, only powdery dross. The furnace was again carefully scraped.

In this run 109.2 pounds of ingot and 2.5 pounds of spillings, or 111.7 pounds of good metal, were obtained. The dross gave 1.1 pounds of manganese-bronze buttons and iron borings coarser than 14 mesh and 3.3 pounds of dross under 14 mesh. The period from the time of starting the arc to the final stopping of it was 45 minutes, of which the arc was on 39 minutes. The power consumption was 24.5 kilowatt-hours in all, or 20.2 kilowatt-hours per 100 pounds of metallic material charged. The power input averaged 38 kilowatts.

This heat being the last for which a charge of borings was on hand, all possible precautions were taken to prevent metal losses.

HEAT L41.

The power input was reduced, and the furnace door was not luted tight until after the smoky flame of the burning oil had ceased.

More salt was used to give a fluid slag and thus promote coalescence of the metal globules, and some of the salt was added with each charging of borings instead of after all the borings were in.

A lower pouring temperature was used, as in the commercial melting of manganese-bronze borings these would form only a small proportion of the charge if used without ingoting, and when all borings are run down to ingot, there is no reason for heating any hotter than enough to pour well.

However, the greatest alteration in procedure was the use of a smaller charge (about 110 pounds instead of 120, as before), and charging less material at one time. In heats L39 and L40, both at the start and at the second charging, borings were piled up to within about 2 inches of the arc. This condition would tend to cause local overheating before the charge had melted down enough to permit it being rocked without the electrodes becoming short-circuited from the mass of borings falling on them. In heat L27, on 100 pounds of yellow chips with 20 per cent zinc content, which gave only 1.1 per cent loss, 60 pounds was charged at the start and 40 pounds later.

In heat L41 the arc was started 19 minutes after it had been stopped on the preceding heat. Only 55 pounds was charged at the start,

leaving 3 or 4 inches free space about the arc. Also 1.5 pounds of common salt and some charcoal were put in. After 3 kilowatt-hours had been used the door was luted tight, and when 5 kilowatt-hours had been used rocking was begun. In 21 minutes 8.5 kilowatt-hours had been used, then the arc was turned off for 6 minutes and about 30 pounds of borings and 1 pound of salt were charged. As soon as the oil had burned off the door was luted and rocking begun. After running 8 minutes with a power input of 4 kilowatt-hours, the arc was again shut off 5 minutes and the rest of the borings, about 25 pounds, with 1.5 pounds of sodium chloride, was charged. Luting and rocking were done as before. After 8 minutes, in which 5 kilowatt-hours was used, the temperature was 890°C . The arc was off 3 minutes for opening the furnace, taking the temperature, and reluting the door. It was then run 4 minutes—power input, 1.75 kilowatt-hours—and the temperature was 920°C . The metal did not “jump” when the pyrometer tube was thrust in, and poured well at this temperature. There was no outrush of zinc vapor when the furnace was opened, although there was some “zinc flare” from the stream of metal while pouring. The metal was covered with a fluid slag that skimmed well. The period from the moment the arc was first started until it was shut off at the end of the melt was 55 minutes. During this time the arc was on 41 minutes. The total power used was 19.25 kilowatt-hours, or 17.5 kilowatt-hours per 100 pounds of metallic material. The average power input was 28 kilowatts.

In this run 101.75 pounds of ingot and 1 pound of spillings were obtained, or 102.75 pounds of good metal. The slag gave 2.75 pounds of clean shot and iron borings; thus the total quantity of metal recovered was 105.5 pounds.

GENERAL RESULTS OF THE THREE HEATS.

After the furnace had cooled, 2.55 pounds of large manganese-bronze buttons with some iron borings and 9 pounds of the black powdery dross finer than 14-mesh were taken from the cold furnace. It does not seem probable that the dross, from the first or the second heats, that was not dislodged by scraping held metal from these two heats which was given up on the third, because the walls were scraped free of all material that would come off readily, and the pouring temperature of the third heat was more than 100°C . lower than those of the first two. Hence the recovery from the furnace obtained after cooling should probably be credited wholly to the first two heats, and mainly to the first.

All of the dross, 1.9 pounds from heat L39, 3.3 pounds from heat L40, and 9 pounds from the cold furnace, total 14.2 pounds, was mixed, sampled, and analyzed for copper and iron. It showed 22.3

per cent copper and 15.4 per cent iron. With 58 per cent copper in the manganese bronze, this composition corresponds to 5.1 pounds of manganese bronze and 2.2 pounds of iron. If heat L39 be credited, in addition to the dross skimmed off in that heat, with all the dross that was clinging to the furnace, the total quantity for that run is 10.9 pounds of dross, corresponding to 4.2 pounds of manganese bronze and 1.7 pounds of iron. Heat L40 would be credited with 3.3 pounds of dross, corresponding to 1.2 pounds of manganese bronze and 0.5 pound of iron.

Thus metal recoveries and losses for these three heats may be distributed as follows:

TABLE 3.—*Results of melting manganese-bronze borings in laboratory rocking electric furnace.*

	Heat No. L39.	Heat No. L40.	Heat No. L41.	Total.	Average.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Per cent.</i>
Weight of material charged.....	120.0	120.1	109.55	349.65	
Metallic material in charge (oil free).....	118.3	118.4	108.0	344.7	
Oil in charge.....	1.7	1.7	1.5	4.90	1.4
Good metal recovered:					
Ingot.....	105.85	109.20	101.75	316.80	90.5
Splittings.....	1.00	2.50	1.00	4.50	1.3
Total good metal.....	106.85	111.70	102.75	320.30	91.8
Bronze and iron shot recovered:					
Over 14-mesh in size.....	2.75	1.1	2.75	6.6	1.9
Under 14-mesh in size—					
Bronze.....	4.2	1.2	None.	5.4	1.5
Iron.....	1.7	0.5	None.	2.2	0.6
Total bronze and iron shot.....	8.65	2.8	2.75	14.2	2.1
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>		
Percentage of good metal.....	88.6	93.0	94.2		
Percentage of bronze and iron shot.....	7.1	2.4	2.5		
Percentage of oil.....	1.4	1.4	1.4		
Total proportion of original charge accounted for.....	97.1	96.8	98.1		
<volatilization loss (by difference).....	2.9	3.2	1.9		

• 0.2 from dross; 2.55 from furnace cleanings.

In the preceding table the amount of shot, iron borings, and fine dross taken from the cold furnace has all been credited to heat L39, as the bulk of this material evidently came from the charge used in that run, and there is no way of telling how to apportion it among the different runs. However, from the difference in violence of "spitting" of zinc at the end of the heats, the loss from volatilization in run L39 was evidently larger than that in run L40, which in turn was larger than that in run L41.

To check these calculations, the ingots were analyzed for copper with results as follows: Heat L39, 61.8 per cent; heat L40, 60.1 per cent; and heat L41, 59.7 per cent. Let it be assumed that there was no mechanical loss of copper, and that the original borings were not sufficiently contaminated with yellow brass to raise their copper content above 58 per cent. Also, assume that the iron content was 1 per cent, which seems reasonable from the amount of mixed shot and iron recovered. Then the charge used in heat L39 contained

97.6 per cent manganese bronze, 1 per cent iron, and 1.4 per cent oil. As the charge weighed 120 pounds, there was 120 times 0.976, or 117.2 pounds of manganese bronze, and 117.2 times 0.58, or 68 pounds of copper in it. If the 61.8 pounds copper in the recovered alloy corresponds to 68 pounds, the weight of bronze recovered, figured from the analysis, would be $(68 \times 100) \div 61.8$, or 110 pounds. Thus the zinc loss would be 7.2 pounds, or 6.15 per cent.

Similarly, in heat L40, the amount of manganese bronze in the charge was 120.1 times 0.976, or 117.3 pounds, and the amount of copper was 117.3 times 0.58, or 68.05 pounds. The recovery of bronze would be $68.05 \div 0.601$, or approximately 113.5 pounds, showing a zinc loss of 3.8 pounds, or 3.2 per cent.

Likewise, in heat L41, the quantity of bronze in the charge was 109.55 times 0.976, or 107 pounds, and the amount of copper was 107 times 0.58, or 62 pounds. The amount of bronze recovered would be $62 \div 0.597$, or 104 pounds, and the zinc loss would be 3 pounds, or 2.8 per cent.

The method of figuring losses by analysis is always unsatisfactory. For example, if there had been 5 per cent of 2.1 yellow brass in the original borings, the copper content of the charge in heat L41 would be calculated as follows: 5 times 66.6, or 3.33 per cent, plus the product of 95 times 58, or 55.1 per cent, making 58.43 per cent copper in the charge. Then the figures for heat L41 would become: 1.07 times 58.42 = 63.52 pounds of copper, and $63.55 \div 0.597 = 106.5$ pounds of bronze recovered, showing a zinc loss of 0.5 pound or less than 0.5 per cent.

This calculation illustrates the closeness of analysis necessary for calculating losses by analysis.

It seems probable that the results obtained in heat L41, where 94.2 per cent good metal and 2.5 per cent mixed shot and iron, or a total of 96.7 per cent metallic material was recovered, which, allowing 1.4 per cent for oil content, shows a loss of 1.9 per cent metallic material, could be consistently duplicated or bettered with further practice.

Some of the same lot of manganese-bronze borings was melted in an oil-fired crucible furnace by the company, and gave the following results. For this part of the lot an oil determination showed 1.2 per cent.

Results of melting manganese-bronze boring in oil-fired crucible furnace.

	Heat 1.	Heat 2.	Average.	
	Pounds.	Pounds.	Pounds.	Per cent.
Oil borings charged.....	275	276		
Ingot recovered.....	235	231	233	84.7
Metal in skimmings.....	17	21	19	6.9
Oil in borings charged.....	3.3	3.3	3.3	1.2
Metal lost.....	19.7	19.7	19.7	7.2

Results with oil-crucible furnace and those with electric rocking furnace compared.

	Oil furnace.	Electric furnace.	
		Average.	Best.
	Per cent.	Per cent.	Per cent.
Ingot recovered.....	84.7	90.5	94.2
Total metal recovered.....	91.6	95.8	98.7
Oil content of charge.....	1.2	1.4	1.4
Metal lost.....	7.2	3.0	1.9

Although the results of heats L39 and L40 indicated that even when the furnace is rocked, local overheating can take place, those of heat L41 indicated that by using enough flux, keeping the charge far enough away from the arc, and rocking the furnace, local overheating can be avoided and low metal losses obtained.

It seemed probable from this test that more thorough stirring, such as would be obtained by giving the furnace a longitudinal as well as a circumferential motion, would be desirable.

The power consumption on the manganese-bronze runs in the electric furnace was as follows:

Results showing power consumption in melts of manganese-bronze borings in electric furnace.

[Furnace was cold at start.]

Item.	Heat L39.	Heat L40.	Heat L41.
Weight of charge, pounds.....	120	120	110
Time arc was on, minutes.....	54	39	41
Pouring temperature, °C.....	1,050	1,040	920
Average power input, kilowatts.....	41	38	28
Number of kilowatt-hours used.....	32	24.5	19.25
Power consumption, kilowatt-hours per 100 pounds of metallic material charged.....	26.6	20.2	17.5

TEST OF NICKEL BRASS.

Nickel brass, like yellow brass, is a rolling-mill alloy that is almost always melted in crucibles. The large zinc content causes, in general, a high metal loss, especially when the alloy is being made from new metals, for the melt has to be heated very hot to get the nickel to dissolve in the copper. On account of the high temperature, the crucible life is short.

The melting of nickel brass seems to offer a good field for the electric furnace, the advantages being, as in melting yellow brass, the possibility of saving zinc, the elimination of crucibles, and working with a large furnace, thus reducing labor costs. The saving in metal, the cheaper maintenance, and the lower labor cost should offset the increased fuel cost when using electric power instead of using coke, coal, or oil. In order to determine what results could

be obtained, particularly as regards metal losses, in the laboratory electric furnace, about 300 pounds of nickel-brass scrap, consisting of about 18 per cent nickel, 56 per cent copper, and 26 per cent zinc, was obtained from the Riverside Metal Co. through the courtesy of Mr. W. W. Rogers, an official of the company.

This scrap consisted of defective pieces sheared off after some reduction from the original billet. The pieces were about 8 inches long, 1 inch thick, and varied from 1 to 5 inches wide, most of them being about 4 inches wide. They contained small pieces of charcoal, but were otherwise clean, and equivalent to ingot in remelting.

The company stated that in remelting this scrap the metal loss was 1.8 per cent, the fuel consumption was 40 pounds of coke per 175-pound pot (or about 23 pounds per 100 pounds of metal charged), and the No. 60 crucibles averaged 30 heats.

HEAT L42.

A trial heat of 50 pounds in the rocking arc furnace was first made. The run, started with a cold furnace, took 65 minutes and used 35 kilowatt-hours. The metal was poured at 1,100° C., which was too cold. There were recovered 48.65 pounds of ingot and spillings, and 0.8 pound of shot from the skimmings, or 49.45 pounds in all; hence the loss was 0.55 pound, or 1.1 per cent.

HEATS L43, L44, AND L45.

Then a series of three heats, the first one being started with the furnace cold, was run, with the following results:

Results of three heats on nickel brass.

	Heat No. L43.	Heat No. L44.	Heat No. L45.
Kind of charge ^a	Scrap (50.75), spillings (1.95), ingot from heat L42 (47.50).	Scrap.....	Scrap (96.7), ^b ingot (14.2). ^c
Total weight of charge..... pounds.	100.20	100.5	110.9.
Time arc was on..... minutes.	64	58	33.
Pouring temperature..... ° C.	1,125	1,200	1,120.
Power consumption..... kilowatt-hours.	40	30.6	26.3.
Recovery:			
Ingot and spillings..... per cent.	98.3	98.6	107.2.
Shot from skimmings..... do.	0.9	0.4	2.0.
Total recovery of metal..... do.	99.2	99.0	109.2.
Loss.....	1.0	1.05	1.6.

^a Figures in parentheses denote weight in pounds.

^b Charged at start.

^c Charged near end, to cool the melt.

Heat L43 was a little cold, the ingot being slightly "spilly"; heat L44 was just about right and gave good-looking ingot. In heat L45 the temperature was probably at least 1,250° C. and the pressure of the zinc vapor blew the furnace door loose. An ingot was put in

to cool the melt, and cooled it too much. The higher zinc loss in heat L45 is due to this overheating. As soon as the furnace has been run long enough to show what power input is needed for each successive heat, overheating can be avoided.

One pound of a flux of broken glass with 10 per cent soda ash was used in each heat. Also charcoal was used in heat L42, but none was used in the other heats. The flux seemed to be a disadvantage rather than a help.

Excluding the results of heat L45, in which the melt was overheated, the average loss was 1.05 per cent; including it, 1.2 per cent. That is, the electric furnace should save three-fourths of 1 per cent of metal on this type of scrap. From results obtained with electric melting of yellow brass and manganese bronze, one would expect a still greater saving of metal in remelting borings, punchings, or other fine scrap in the electric furnace, as compared with fuel-fired furnaces.

EXPERIMENTS ON COPPER CASTINGS.

Some copper castings were needed for electrode holders on a large electric furnace, and in order to see whether a good quality of metal could be produced in the rocking furnace, the furnace was tried on copper.

The material was scrap copper wire and electrotypes, and as no boron suboxide or other similar deoxidizer was at hand, 1 per cent of zinc was added as a deoxidizer just before pouring.

HEAT L46 AND L47.

Two heats were made. In heat L46, 70 pounds was charged. The arc was on 55 minutes, and 32 kilowatt-hours was used. It took 13 minutes to spelter, pour two molds (the metal was poured direct from the furnace into the mold), and recharge.

In heat L47 the charge was 60 pounds. The arc was on 30 minutes, and 18 kilowatt-hours was used. The metal was poured at about 1,250° C. The power consumption on the first heat, starting with a cold furnace, was at the rate of 45 kilowatt-hours per hundredweight, and on the second, 30.

Two of the four molds, which were made in the Cornell foundry and brought to the laboratory, were not properly gated for pure copper. The castings from these two molds showed shrinkage at the gate, but were usable; the other two, from the properly gated molds, were good. The quality of the metal produced by the furnace was excellent, the castings being entirely free from porosity. The metal losses were not determined.

EXPERIMENTS IN MELTING ALUMINUM CHIPS AND INGOT.

Various heats were made in the laboratory rocking furnace remelting dirty aluminum chips. Such material has the peculiar property of compacting together when the melting point of the alloy is reached, and the finer globules formed by the melting of the smaller chips are prevented from coalescing by the coating of dirt. The mass of globules and dirt mats together and does not become fluid, hence rocking does not stir it properly. Puddling to break up this mass and promote coalescence is not practicable in an arc furnace, which should be run tightly closed. The use of large amounts of flux as an alternative means of promoting coalescence is practicable in crucible or reverberatory furnaces, but not in the rocking electric furnace. The cheapest suitable flux, salt and fluorspar, is volatile at the temperatures required for arc melting, but does not become fluid enough for stirring by rocking to cut down this volatilization. The flux is hard on most refractories. The results of heats L48 and L51 on these chips are recorded in detail (as runs 92 and 95) in a previous report on melting aluminum chips.^a

To make melting of aluminum chips in the rocking furnace practicable, a graphite or graphite fire-clay lining would probably be needed, and a less volatile flux than salt and fluorspar would seem to be required.

Melting ingot or clean aluminum scrap in the rocking furnace is possible, but unless a superior quality of product can be obtained by electric melting neither the rocking furnace nor any other type of electric furnace can apparently compete, as regards costs, with oil or producer-gas fired iron-pot furnaces or open-flame oil or gas furnaces. In particular instances where fuel-fired furnaces give excessive heat, and consequently poor working conditions, the improvement in working conditions might warrant the use of an electric furnace.

The poor showing in electric melting of aluminum is due to the large amount of power required, and also to the fact that only a low temperature is needed, at which fuel-fired furnaces are relatively more efficient than at higher temperatures. In general, it is calculated^b that 800° C. (1,475° F.) is about the lower limit at which electric furnaces normally begin to compete with fuel firing.

In order to find the power needed to melt an aluminum alloy in the rocking furnace, heat L52 was made, with an initial charge of 37 pounds of ingot consisting of 8 per cent copper and 92 per cent aluminum.

Starting with a cold furnace, it took 52 minutes heating and 30 kilowatt-hours to raise the charge to 735° C. Then 25 pounds more

^a Gillett, H. W., and James, G. M., Melting aluminum chips, Bull. 108, Bureau of Mines, 1916, p. 66.

^b Johnson, W. M., and Slegler, G. N., Electric furnaces: Met. and Chem. Eng., vol. 11, 1913, p. 506.

ingot was added, and 10 kilowatt-hours more was put in during 13 minutes. The charge was then at 870° C., or hotter than is needed for pouring aluminum castings.

Thus, it took a total of 40 kilowatt-hours to raise 62 pounds of aluminum to 870° C., and 10 kilowatt-hours to melt 25 pounds and heat it to 870° C. and also to raise the first 37 pounds from 735° to 870° C. This same furnace, starting cold, has melted 127 pounds of red-brass ingot and heated it to 1,140° C. with about 30 kilowatt-hours (Heat L34, p. —). After the furnace is hot, 15 kilowatt-hours has melted and heated to 1,220° C. 130 pounds of red-brass ingot (Heat L38, p. —).

That is, about twice as much power per pound of metallic material charged was required for heating the aluminum to its pouring temperature as for heating red brass to its pouring temperature. This result is in accord with the theoretical power consumption. Richards^a has calculated that to raise aluminum to about 710° C. takes theoretically about 278 heat units, whereas to raise brass or bronze to about 1,050° C. takes only about 130 heat units. The difference is due to the extremely high heat of fusion of aluminum, the relative heats of fusion being as follows: Aluminum, 100; copper, 43; zinc, 23; tin, 14; lead, 4. This overbalances the higher temperatures needed for brass and bronze.

In the experiments described, the small laboratory furnace had given low metal losses on red brass, yellow brass of various contents of zinc, on red and yellow chips, manganese bronze chips, nickel brass, and has produced sound copper castings. Considering the small size of the furnace, the power consumption was low. The electrode consumption was not excessive and the refractory lining stood up well.

The furnace would evidently work with fair efficiency on a 10-hour schedule, and could readily change from one alloy to another in successive heats. Hence, it seemed desirable to design and test out a larger furnace of this type.

EXPERIMENTS WITH LARGE ROCKING FURNACE.

DESIGN OF FURNACE.

Heats L39 and L41, on manganese-bronze borings, had indicated the desirability, in melting alloys high in zinc, not to overcharge the furnace or to over-power it, and had shown that the more thoroughly the charge was stirred by rocking the better. Therefore, two modifications of the type, one with a single rocking motion and one giving a doubly oscillating motion to the charge, were designed. These

^a Richards, J.W., Electric power required to melt metals: Trans. Am. Brass Founders' Assn., vol. 4, 1910, p. 93.

were patented and the patents ^a were assigned to the Federal Government, through the Secretary of the Interior as trustee, for the free use of the public. Should interested persons wish to work under these patents, licenses requiring no payment of royalty may be obtained from the Secretary of the Interior, by making application through the Director of the Bureau of Mines.

ARRANGEMENTS FOR COOPERATIVE LARGE-SCALE TEST.

The Detroit Edison Co., Detroit, Mich., has for a long time been interested in the development of electric brass melting, and offered to cooperate in a test of a rocking furnace of commercial size. Mr. C. A. Weeks, the inventor of the Weeks zinc furnace, was invited by the Bureau of Mines and the company to participate in the test, but declined the offer.

Sketches of the furnace design were furnished by the bureau to the company; the latter refined the design, prepared the working drawings, made the parts for the furnace in its own shops and erected it. By the cooperative agreement, the expense of building the furnace and making the test was borne by the company, except for the salaries and expenses of the representatives of the bureau. By an arrangement between this company and the Michigan Smelting & Refining Co. of Detroit, the furnace was erected at the plant of the latter company; the furnace, electrodes, refractories, and power for the test were furnished by the Detroit-Edison Co., while the Michigan company furnished labor for lining the furnace, electrode cooling water, labor, accessories for pouring the metal, and supplied the metal melted.

During the earlier part of the test the charging and operating of the furnace was done by the bureau's representatives alone, later they were aided by a representative of the Detroit Edison Co., and at the end of the test the furnace was operated by a representative of the Michigan Smelting & Refining Co. The test was supervised throughout by the representatives of the bureau.

DESCRIPTION OF FURNACE.

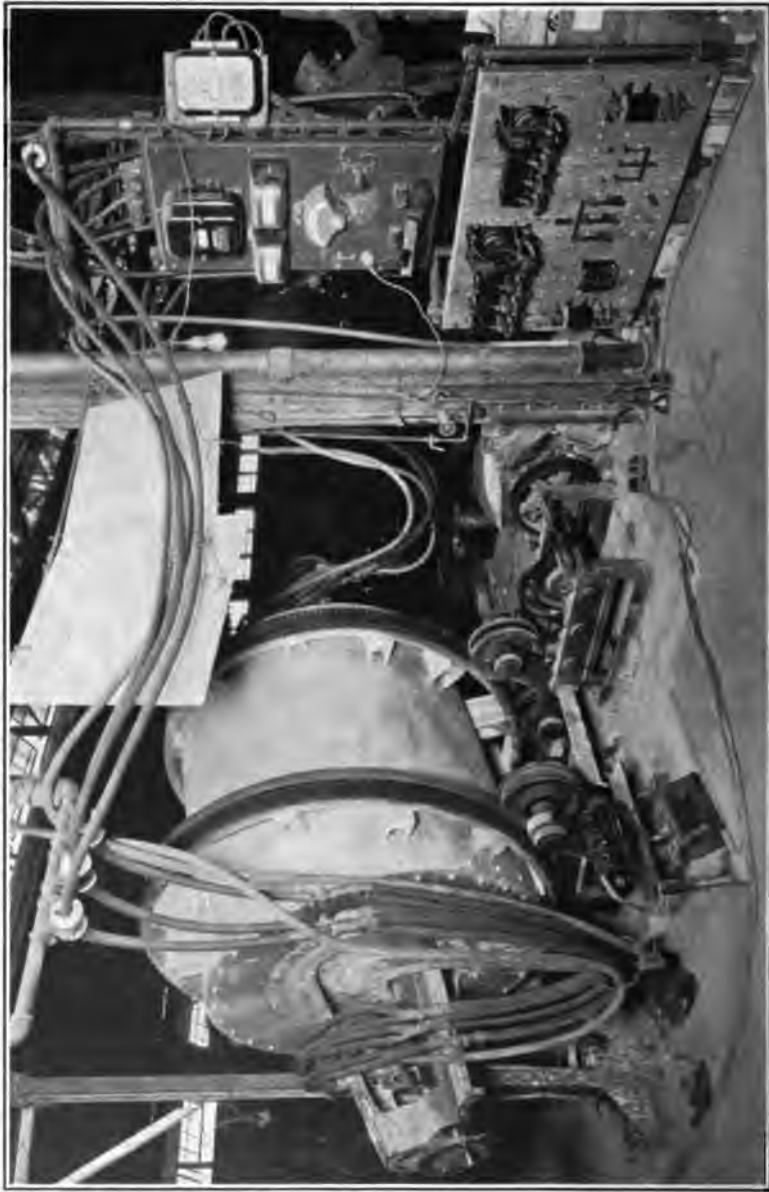
Views of the furnace are shown in Plates II and III. Detail drawings are presented in Plate IV.

The furnace had a cylindrical iron shell 5 feet long by 5 feet in diameter, the drum being mounted within two steel rings. These rings were combined tracks and gears, the track part resting on rollers for support and the gear part meshing with driving gears for rocking. At first the furnace was tilted within the gears for maximum stirring effect but after heat 77 it was set level.

^a Gillett, H. W., and Lohr, J. M., Electric furnace, U. S. patent 1201224, Oct. 10, 1918; Gillett, H. W., Electric furnace, U. S. patent 1201225, Oct. 10, 1918.



LARGE-SIZE ROCKING ELECTRIC BRASS FURNACE. SHOWS CHARGING DOOR AND ADJUSTABLE ELECTRODE HOLDER.



LARGE-SIZE ROCKING FURNACE. SHOWS ELECTRICAL CONNECTIONS, SWITCHBOARD, AND MOTOR-CONTROL DEVICES.

Graphite electrodes passed through the central part of each end of the drum. The electrode holders were adjusted by handwheels actuating a screw that moved a sliding support of the lathe type. Regulation of the arc was by hand, no automatic regulator being used. The single-phase arc was between the tips of the two electrodes.

The charging opening, 15 inches long by 10 inches high, was closed with a plug-type door lined with $4\frac{1}{2}$ inches of "corundite" brick. The door had flanges seating on the shell and conforming to its contour, and was held in place by a transverse bar. The door was not hinged to the shell, but was removed by a chain hoist working on a small jib crane whenever the furnace had to be opened. Below the door was a pouring spout 2 inches wide and $1\frac{1}{2}$ inches deep, which was closed with a brick plug. Both door and spout were luted in place with fire clay. The door did not have to be removed for pouring.

ROCKING AND POURING.

Through an automatic device, the furnace could be rocked by a motor back and forth about 80° from an extreme position at which molten metal would not quite run into the spout. A complete oscillation, from one extreme point to the other and back to the first, took $13\frac{1}{2}$ seconds. This was called the "safe rock" (see fig. 1), and was begun when approximately one-half the power input needed for any heat had been used; it swashed the unmelted material about in the molten part and tumbled the solid material over, so that fresh surfaces received the direct radiation from the arc. The angle of rocking is so small that solid material does not drop onto the electrodes and break them. As soon as most of the charge is melted, so that electrode breakage will not ensue, the angle of rocking is increased through the controlling device to "full rock," about 200° . One limit is the same as on the "safe rock"—that is, where the molten metal will almost run into the spout—and the other is where the molten charge almost reaches the charging door. Thus all of the hearth circumference is washed by the molten metal, except the 10-inch height of the charging door plus a few inches each side of it. A complete oscillation on "full rock" takes $33\frac{1}{2}$ seconds.

By turning a handle on the controlling apparatus, the angle of rocking can be made anything between about 80° and about 200° . It is desirable to increase the angle of rocking from time to time during the heat, so as to wash the walls and stir the metal as much as possible without danger to the electrodes from solid material falling on them.

Thus the part of the hearth that serves as a roof when the furnace is stationary is subjected to continuous direct radiation from the arc only while the metal is being melted, and while the heat capacity of the charge is still high. The roof then gives up its excess heat to

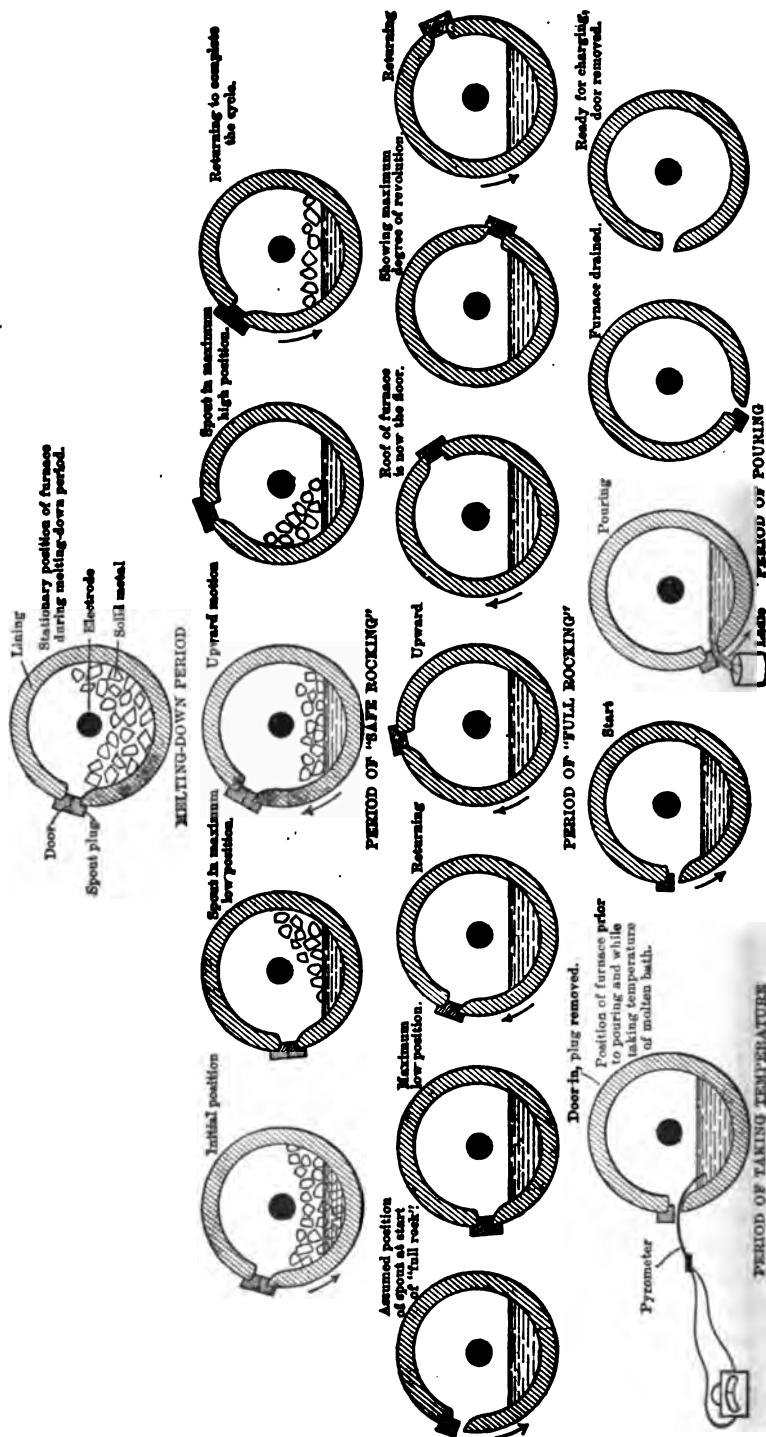
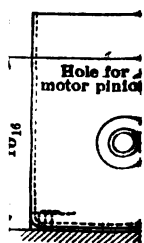
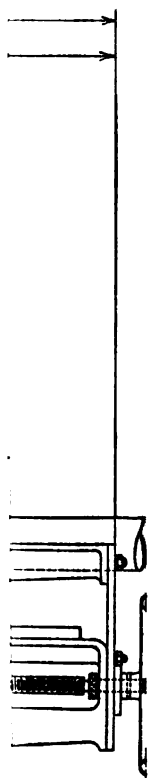


FIGURE 1.—Diagrams showing positions of furnace during melting, rocking, and pouring.



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the molten metal that washes it, and at the end of the heat is no hotter than the metal.

In an unrocked furnace the heat stored in the roof at the end of a melt will raise the temperature of the metal for some time after the power is cut off. In a rocked furnace the hearth and the metal are kept at the same temperature and the charge does not get hotter after the power is off, so that control of the pouring temperature can be much closer.

The rocking also stirs the metal thoroughly and thus prevents the superheating of the top of the melt that results in an unrocked indirect-arc furnace.

Thus rocking accomplishes four important results, as follows:

1. Prevents surface superheating and consequent zinc losses.
2. Thoroughly mixes the metal.
3. Cools the refractory lining to the temperature of the metal, thus increasing the lining life and decreasing the radiation losses and hence the power consumption.
4. Makes close temperature control possible by minimizing the storage of heat.

The rocking was by an 11-horsepower alternating-current motor, but tests showed that a 5-horsepower motor would be ample. For pouring a portable reversing switch, with leads incased in flexible metallic tubing, allowed the operator to pour from a position where he could readily see the stream and the inside of the ladle. By cutting the automatic rocking device out and the pouring switch in, the spout could be depressed past the limiting position for rocking and the metal could be poured.

Both rocking and pouring were controlled by solenoids at the switch-board, the solenoids actuating two contactors which made and broke the motor circuit, thus running the motor and turning the furnace in either direction.

The automatic control for the rocking mechanism was designed and built by Mr. Oliver Marsick, of the Detroit Edison Co., to meet the specifications prepared by the Bureau of Mines' representatives, and worked very satisfactorily. Ordinary care must, of course, be taken to keep all electrical contacts clean.

A small buggy, running on a track laid beneath the furnace, held the ladle during pouring.

REFRACTORY LINING.

The furnace had an inner layer of "corundite" $4\frac{1}{2}$ inches thick, laid in "corundite" cement, this layer being brought out to the shell about the door and the electrodes. Back of this was a $4\frac{1}{2}$ -inch layer of "heat insulating" brick, laid in asbestos cement, and back of this a 3-inch layer of infusorial-earth brick and infusorial-earth cement.

This gave a lining 12 inches thick, leaving the hearth chamber 36 inches long and 36 inches in diameter.

In the ends 8-inch holes were left in the corundite for the electrodes. These holes were lined with a 2-inch layer of alundum cement to prevent current leakage through the hot brickwork.

The furnace would normally be rated at 1,500-pound capacity. It will take 2,000 pounds and has been operated with that charge, though the usual charge was 1,300 to 1,320 pounds, this being used instead of 1,500 pounds because the crucibles used as ladles held 650 to 660 pounds and the 1,300 to 1,320 pound charge just filled two ladles.

ELECTRODES.

The electrodes, 4 inches in diameter, were of Acheson graphite with threaded nipples for continuous feeding. Electrodes 5½ inches in diameter were first tried, but were found unnecessarily large. Also, 4-inch electrodes with male and female joints were tried, but were less satisfactory than those with the nipple joint. It was found advisable, in order that successive sections should be properly gripped by the electrode holders and should fit the electrode openings closely, to machine the electrodes to $4 \pm \frac{1}{8}$ inches in diameter. The electrodes as received varied in diameter and many were far from straight.

At first the 4-inch electrodes were not water cooled; they became so highly heated that they burned away a little just outside the furnace. Then water-cooled brass sleeves were used; these were later discarded for a simple coil of ½-inch diameter copper pipe, having six turns, the inner two turns being 6 inches in inside diameter, embedded in the alundum cement, and the outer four being 4½ inches inside diameter, the coils being separated about ½ inch. Water was passed through the electrode holder, thence to the coils and then to the outlet. The flow of water through the holders and coolers of both electrodes varied from 1½ to 3 gallons per minute, and the heat thus abstracted amounted to between 6 and 10 kilowatts, averaging about 7½ kilowatts per hour while the furnace was in operation. The electrodes when thus cooled would stand an average of 2,000 amperes, with a short-time maximum of 2,500 amperes and an instantaneous maximum of 4,000 amperes, without any trouble from overheating.

POWER SUPPLY.

Power was taken from one phase of the Detroit Edison 3-phase, 60-cycle, 4,600-volt circuit. Two hundred and twenty volts was tried on the furnace in heats 1 and 2 at the start of the test, without reactance, and again in heats 219 and 220 later in the test, with reactance. However, even with the reactance the arc was uncontrollable at this voltage and drew 3,000 to 4,000 amperes, or 500

to 600 kilowatts. Also, 105 volts was tried, without reactance, in heats 3, 4, and 5, but did not give a high enough power input, so the voltage was changed to 131 volts on open circuit during heats 6 to 218, inclusive. Three 100-kilovolt-ampere transformers were used to step the current down from 4,000 to 110 volts; the voltage was then boosted to 131 volts with a 50-kilovolt-ampere transformer. From heats 221 to 249, inclusive, 127 volts was used, and from heats 250 to 301, 117 volts. The furnace was found to work satisfactorily at any voltage between 115 and 140 volts.

The transformers could not be placed close to the desired position of the furnace, and the secondary leads ran about 75 feet from transformers to switchboard. On each side of the circuit four 500,000-c. m. cables were used, or in all about 600 feet of cable. No reactance other than that inherent in the furnace leads and transformers was used in heats 1 to 77. In these tests, made before an external reactance was added, the power factor would start at about 65 with a cold furnace, rise promptly to 85, and then increase to more than 90 as the furnace became hot. Most of the time the power factor was 90 to 95 on the basis of instantaneous readings, or 90 to 99 by a power-factor meter.

In order to stabilize the arc, make it require less attention from the operator, and reduce surging, an external reactance was used after heat 78. This reactance was made of four turns of a pair of 750,000-c. m. cables, the turns being 14 inches in diameter, with about 250 pounds of laminated iron strips, 2 by 19 inches in size, held in a bag tied within the turns. This crude reactance reduced the current on dead short circuit from about 13,000 amperes without it to 4,000 amperes with it. The voltage across the arc and the reactance under full load averaged about 115, the current varying from about 1,500 to 2,000 amperes. The power factor of the furnace, plus reactance, taken on the secondary side averaged about 85 (instantaneous readings), while that on the primary side (power-factor meter) averaged about 77.

The power factor was high enough to avoid a power-factor penalty and to be satisfactory to the central station. The taking of an average load of 200 kilovolt-amperes off one phase of the three-phase circuit was not objectionable to the power company. The substation operator could tell whether the furnace had current on or not, but it did not disturb the voltage control of the circuit enough to inconvenience other customers on the same line.

SWITCHBOARD AND METERS.

The switchboard was placed about 6 feet back of the furnace, where the meters were readily visible to the operator. It carried an integrating watt-hour meter readable to 1 kilowatt-hour, for the furnace

circuit, connected on the secondary, and another similar meter for the motor circuit.

Also, a voltmeter, an ammeter reading to 3,000 amperes, and a watt meter reading to 300 kilowatts were placed in the secondary circuit. A main switch on the secondary circuit was provided at the switchboard, and an oil switch and circuit breaker were placed in the primary circuit back of the transformers. The switchboard also carried the solenoids, contactors, and switches for the motor circuit for rocking and pouring.

FLEXIBLE LEADS.

Three 500,000-c. m. cables, one on each side, were run from the switchboard to points above and slightly back of the furnace, and from these, six 300,000-c. m. flexible brush-holder cables in about 9-foot lengths brought the current to each electrode. The flexible cables were allowed just enough sag to permit their reaching easily in all positions of the furnace without at any time touching the floor.

These cables were clamped rigidly to a framework about the electrodes, thus taking the strain off the electrode, and enough slack was left between the point at which they were clamped and the electrode holder to permit moving the electrode in and out freely.

COST.

On the basis of cost of the experimental installation the Detroit Edison Co. calculates that, with the experience gained in this test, a complete furnace of this size, including transformers and switchboard, could be erected, at early 1918 prices for materials, for about \$5,000. License to use the Bureau of Mines patents, of course, involves no royalty. This cost is low compared with the prices of most electric brass furnaces of corresponding sizes that are on the market, but, of course, does not include any manufacturer's profit, payment for expenses incurred in development of the furnace, or salary and expenses of a skilled operator to start the furnace and instruct the buyer in its operation, which are legitimately included in the prices of electric furnaces of other types.

PLANT CONDITIONS.

The Detroit Edison Co. chose to install the furnace at the plant of the Michigan Smelting & Refining Co., because of the proffered cooperation of that firm, which makes a wide variety of alloys.

This plant does no sand casting, but does a general refining business, and its brass foundry makes ingot to standard composition, or to the purchaser's specifications. The raw material used is mainly borings, ingot from the reverberatory refining furnaces, and copper, lead, tin,

and brass scrap of various kinds. The borings are mechanically mixed with great care, are passed through magnetic separators, and a sample pot is carefully run down and analyzed. The reverberatory ingot is also analyzed, and the charge is calculated on the basis of the analysis. Rapid check analyses are made on the first heat of any new charge to verify the calculation. Drillings are taken from an ingot from each pot poured, and the drillings from a number of pots are mixed to give a composite sample, which is then analyzed to prove that the product is within the specified limits of composition.

The borings are with few exceptions very oily, rarely carrying less than 3 per cent oil and often 6 per cent. Some of the copper used is ingot from the reverberatory furnaces, some is sheared heavy scrap, but most of it is skeleton copper or wire "cabbaged" into bundles in a hydraulic press. Also short lengths of copper pipe and punchings are sometimes used.

Another material is "sweated" and "cabbaged"—old automobile-radiator sections. In making yellow brass a good deal of nickled brass, plumbing fixtures, pipe, thermos bottles, shaving-soap boxes, etc., and much "medium brass," such as cornets, cuspidors, automobile hub caps, etc., are used.

Such material is charged without bundling and is extremely bulky. This material and the cabbaged copper wire often carry considerable nonmetallic material, and the borings often contain dirt and non-metallic material other than oil or moisture.

In the regular shop practice the charge is melted in coke fires, using No. 250 crucibles with a capacity of 650 pounds of red brass or 600 pounds of yellow brass. At the time of the test these crucibles cost \$37.50 each and lasted, on an average for different lots and makes, four to nine heats, averaging probably not more than six heats. Crucibles bought before the war cost \$8 each and lasted 18 heats.

In an attempt to eliminate the use of crucibles open-flame furnaces had been installed, but the production in these furnaces, from scrap and borings, of alloys containing much zinc or lead has been found impracticable. Ingot for railroad "brasses," that is, a bearing bronze with 12 per cent or more lead, was made in large amount during the period of the test, but such ingot could not be produced from scrap charges in the oil furnaces because of the loss of lead and the variable composition resulting therefrom.

The management considered that from the raw material used practically nothing but a true bronze could be made in the oil furnaces. These furnaces were not run during the period when the electric furnace was being tested, both of them, in fact, being removed to make room for other apparatus.

The coke fires average three heats in 10 hours. One furnace tender handles three furnaces; the coke and the charges are brought

to him, and the pot is pulled by an electric hoist and is poured by a pouring gang.

The metal is poured into molds on a conveyor and, after freezing as it runs along the conveyor, is dumped into water.

The larger chunks of metal are handpicked from the skimmings, and these, with the drippings and spillings made while the pot is being poured, and any ingot, obtained from the last metal in the pot, that is below standard size, as well as metal recovered from the ashes when a pot breaks, if such recovered metal is not materially altered in composition, are fed back into subsequent pots having charges of the same composition.

The skimmings and ashes, together with any spilling that has become mixed in composition through failure to clean the drip pans at the proper time, are sent to the crushing and concentrating plant, and the concentrate is fed to the reverberatory furnaces.

As the three melts of a day's run in any one furnace may differ in composition and adjacent furnaces may run different compositions at the same time, the recovery from ashes and skimmings can not be allotted among the different alloys made, and the true net melting losses are never known.

Neither was it possible even to estimate, from the records available, what the average recovery from the ashes and skimmings was on the foundry output as a whole during any given period.

Since only the gross and not the net coke-fire losses were ascertainable, in the electric furnace tests the same procedure was followed. Large chunks of metal were picked from the skimmings, the metal spilled during pouring was swept up, pouring drip was recovered from the drip pan where practicable—in most tests the operator was too busy charging the next heat to scrape up the drip from the electric-furnace ladles, and it went back to the coke fires with the regular foundry drip—and these, with any small ingots from the tail of the ladle, were fed back into other charges of the same composition. The electric furnace often ran only one or two consecutive heats on the same composition, whereas the coke fires usually ran a larger number. The result was that in comparing gross losses the electric furnace was at a disadvantage on single heats or short runs where spillings, drippings, and short-weight ingots could not be fed back. Hence, in the figures following, the net loss with the electric furnace is more nearly comparable to the gross loss with coke-fired furnaces than the gross electric-furnace losses are, when that furnace made short runs and the coke furnaces made a large number of pots.

In pouring the pots the loss of drip, when not fed back, averaged 0.27 per cent on 424 pots and was the same in pouring from the electric as from the coke furnaces.

The usual crucibles, more or less preheated in a coke fire, were used as ladles for the electric furnace. They were often cold and as a result sometimes became skulled to some extent. The skulls were sometimes recovered, but often the foundry needs when a pot broke would require shifting the skulled pot to a coke fire, so that some skulls were not credited to the electric-furnace metal-loss account.

Using graphite crucibles as ladles is an expensive and unsatisfactory procedure. Clay-lined, iron ladles and suitable oil or gas-fired preheaters should be provided.

It is necessary to point out these sources of inaccuracy in the metal-loss comparison, because the plant conditions made it impossible to get true net losses in either type of furnace. The borings were often analyzed for oil content, but the exact content was difficult to estimate and varied widely, owing to oil soaking down to the bottom of the pile of borings. The large amount of oil and the unascertainable amount of nonmetallic material other than oil made the true metallic content of the charge doubtful. The only reliable figures are the gross weight of charge, this including oil and dirt, and the weight of good ingot obtained. The ingot weights did not always check exactly on different scales, although the scales were constantly tested and adjusted, and the tares of the skids on which ingot was trucked and weighed would vary from those marked. In the long run, however, the figures for gross metal loss may be taken as giving a true comparison between the gross losses in the two furnaces.

It should be emphasized that the figures given for gross loss include oil and dirt and do not show the true loss of metal in either furnace, being much higher because of the high nonmetallic content of the charge. They merely give the comparative results in the two types of furnace when melting on the same dirty, oily material.

DELAYS.

More time was required for charging bulky materials like borings and "cabbaged" scrap than would be required with all ingot or heavy scrap. To facilitate the charging of bulky material, the door should be larger and it should be possible to draw the electrodes back entirely into the walls so the charge can be thrown in instead of having to be placed carefully. For 1,300-pound charges of such material a slightly larger shell and hearth would be of advantage.

Time was also lost in pouring, because it was often necessary to wait 10 minutes to half an hour for the crane to be free. Usually only one ladle was used and the furnace had to stand idle while the first ladleful was being poured and the ladle brought back. Having two hot ladles in waiting in order to empty the furnace promptly

would have saved much time. Also, a larger spout would have permitted a bigger stream and more rapid pouring.

Even under the most favorable conditions met in the tests, the delays in charging and pouring were excessive. In 5 days of 10 hours, 27 heats of 1,300 pounds each were made. Of the 50 hours the arc was on only 32 hours, or 64 per cent of the time, whereas 18 hours or 36 per cent was spent in charging and pouring.

With the improvements for quicker charging and with suitable facilities for rapid discharging, one more heat per day—that is, six or seven heats, depending on how bulky the charge is—should be made in 10 hours, instead of five or six. This would decrease the average power consumption about 3 per cent, because an added heat at the end of the day is made with the furnace hot and in the condition to melt at highest efficiency.

EFFECT OF OIL IN THE CHARGE.

Another source of delay was the time required for burning off the oil in the borings. Centrifuging the borings, thus recovering the oil, or still better, briquetting them under heavy pressure so as to squeeze out the oil and make them compact enough to charge like ingot would save much time in charging. When the borings are very oily, or charged in large quantities, the oil is not driven off rapidly. While the oil vapor is in the furnace the arc will not hold properly, as oil vapor is not a good electrical conductor.

Neither can the furnace be sealed tight until practically all the oil is burned off, on account of the pressure of the vapors. Hence, in using oily borings, if the furnace is not hot already, it should be preheated empty till the walls are hot. Then the borings are charged. With the door out to let the oil escape, the furnace is rocked a few minutes until the oil is nearly all burned off, when the rest of the charge is added.

It might be worth while to insert a pipe, carrying an air blast, into the furnace for a few moments after oily borings are charged, in order to burn the oil more quickly and within the furnace where some of the heat of combustion would be absorbed, rather than to burn the distilled oil outside the furnace.

Preheating for the first heat in the morning can be avoided by charging the borings or the entire charge after the last heat on the previous day, while the furnace is still hot.

In the tests, the average weight of borings and their average oil content was such that almost always at least one gallon, and often three, of oil had to be driven off.

The oil vapor gives a reducing atmosphere in the furnace while charging, prevents oxidation of the electrodes, and the vapors driven off last carbonize, thereby producing soot that serves for charcoal,

no charcoal being required. However, if too much soot is permitted to form, the soot is likely to entrain metallic shot and thus cause too high a gross metal loss.

METHOD OF CHARGING.

It was found desirable to place the whole charge in the furnace at the beginning, rather than to melt part of it, open the furnace, and add the rest. In a furnace that is not sealed, and is open to the air or in one that can be provided with a loosely-fitting, quick-acting door, part of the charge can be melted and the rest added from time to time in small portions that will not freeze the metal already melted. But in melting alloys high in zinc or lead, an open furnace means a high volatilization loss, and the rocking furnace, which gives a means of reducing this loss, should as much as possible be run sealed tight. Hence frequent charging in small portions will not work as well, though some classes of material are so bulky that the charge must be added in two or three portions. If, say, half the charge is melted and then the rest added, the cold charge may, especially if made up of large ingot, freeze the whole into one solid slug, which is very hard to melt and which is likely to be rocked through the full arc too soon and thus fall on the electrodes and break them.

When the charge is largely light scrap, like cuspidors, etc., it can be piled up above the electrodes and in contact with them, as its weight is not sufficient to break them. The current is then thrown on with the primary oil switch, and any electrical connection between the electrodes (previously separated) is at once burnt out by the momentary short circuit. With ingot or cabbaged scrap, such connection can not be permitted, as it causes too heavy a short circuit.

When ingots, or large and heavy "cabbages" of bundled scrap are being charged, the use of a suitable charging paddle for placing the charge properly was found desirable. The pieces could be placed exactly where wanted, and time was saved.

For a long time the lead was added at the end of the heat. This necessitated opening the door, adding the lead, closing the door, and rocking to mix the metal. Later it was found that there was no loss of lead and no segregation if the lead were added with the main charge; and, still later, adding zinc with the main charge was found to be desirable. Knowledge of various small details like this, such as knowing when it is safe to increase the rocking arc, when enough oil has been driven off, so that the spout can be luted with clay and stay tight and so that the soot will not entrain an excessive amount of metal, when to reduce and when to increase the flow of electrode cooling water, etc., is readily gained by experience in operating the furnace.

TEN-HOUR OPERATION.

Throughout the test on 10-hour operation, except for four or five nights early in the test, the furnace was not heated at night, either by electricity or otherwise. Putting coke in at night was tried, with admission of various amounts of air, but proved to do more harm, through coke and ash being stuck to the lining by slag, than the small amount of heat developed did good. The furnace was run 10 hours or less, as the foundry did not run at night and it was impossible to arrange for pouring until the latter part of the second test, which will be described later. In comparing the power-consumption figures for the rocking furnace, run on a 10-hour schedule, with those for other furnaces run on a 24-hour schedule or kept hot at night by power, this fact should be kept in mind.

ELECTRODE CONSUMPTION.

The actual electrode consumption was 16.3 pounds for 21,660 pounds of material melted, or $1\frac{1}{2}$ pounds (about 20 cents at normal or about 40 cents at early 1918 prices) per ton. The loss from accidental breakage, after experience had been gained, was small. In heats 96 to 218—122 heats, 102 on 1,300 to 1,320 pound charges, and 20 on 600-pound charges—there were nine breakages in melting 144,000 pounds, or 1 for each 8 tons. Four of these were from starting the "safe" rocking too soon, and five from hitting the electrode in charging bulky material.

In the latter event the breakage was usually only a nipple. Broken pieces may often be reused by machining, or may at least give enough stock from which to make a nipple. Breaking in charging can be avoided by so arranging the electrodes that they can be drawn into the refractory lining. In estimating the probable cost for electrodes in such a furnace, an allowance for loss through breakage equal to the actual consumption will certainly be ample.

LINING LIFE AND COST.

The "corundite" brick and cement for the inner layer of one lining cost about \$100; the "heat insulating" brick and asbestos cement for the middle layer cost about \$150. The infusorial-earth brick and cement for the outer layer, and the alundum cement about the electrodes, cost about \$50. Thus the total cost for refractories was \$300.

It took a furnace mason and two helpers about five days, that is, a total of 150 man-hours, to line the furnace. Much of this time, however, was spent in chipping the heat-insulating brick from standard to wedge shape, and much more in deciding just how the brick had best be laid to give maximum strength, the mason changing

the plan several times, tearing out and relaying the ends and the part about the door. With all brick of proper shape and with a complete lining diagram to go by, 100 man-hours should suffice.

At the end of heat 71, when some 70,000 pounds had been melted, the following record was entered in the notes—"lining shows no wear except at roof, and there barely appreciable."

Between heats 71 and 72, in the absence of the operator, some one experimented with the pouring switch, turning the furnace past the pouring point, tightening up the flexible leads, and running the gear of the automatic rocking control device against a stop, bending part of the control so it had to be removed for repair.

While this part was being repaired, it was necessary to rock the furnace by hand in heats 72 to 77, comprising about 8,000 pounds. No rocking was done in these heats till about 150 kilowatt-hours had been put in, and the rocking was not as continuous thereafter as when done mechanically. In some of these heats with the furnace stationary, the power input was held steady for some time at 250 kilowatts, which is well above the normal power input. In heat 77, some of the lining fell from the "roof." A spot about 15 inches by 24 inches in size, in the center of the roof part was worn away to 1 inch thick, the thickness tapering from this point to the original $4\frac{1}{2}$ -inch thickness on the hearth part. About two-thirds of the corundite lining was removed and replaced with new brick, the hearth being left intact. The layer of heat insulating brick, thus bared, was in good condition. The corundite ends showed traces of wear, and part of one brick had come off. Aside from the patching of this place the ends were not touched.

The cost of relining the roof part was about \$30 for corundite brick and cement, plus wages for 30 man-hours— $1\frac{1}{2}$ days—for mason and helper, tearing out and relining. At about heat 177 there was a little more wear visible at the patched place on the end. This was on the original lining. The new roof part showed no wear at this time. Some lining seemed to be slagging off about heat 177 but this ceased entirely about heat 183.

At heat 193, the furnace mason inspected the lining and pronounced it to be good for an indeterminate period. After heat 218, when about 240,000 pounds had been melted, the whole lining appeared in good shape, the roof being still good, the original hearth as good as ever, and the ends still good, though showing some wear. With heat 218, the first test proper was completed. It was desired, however, to see whether the use of 220-volt current, with the reactance, was possible. The arc was found to be uncontrollable, and the power input was 500 to 600 kilowatts, or three times the normal. This caused failure of part of the roof. During rocking,

much metal soaked into the openings thus made, for the metal losses were high on the 220-volt heats.

When the roof was repaired after heat 77 a layer of brass was found between the corundite and the heat-insulating bricks, except on the very top of the roof part. A thin sheet-iron liner, inserted between these two layers when lining up, should stop the flow of brass through the joints and prevent it from penetrating farther, thus reducing the amount of metal lost into the lining, preserving the outer layers intact, and reducing the heat loss from radiation by preventing soakage of metal into the brick beyond the corundite layer.

Evidently the failure of the roof at heat 77 was due to lack of sufficient rocking in heats 72 to 77, perhaps combined with too high a power input in those heats. The original roof failed after 78,000 pounds were melted, the power input in that time being enough to melt 100,000 pounds, if the furnace had been run steadily and at full output instead of on an experimental basis. The second roof was still good after about 160,000 pounds more, equivalent to about 200,000 pounds if the furnace had been run steadily, had been melted. The hearth and ends were still good after melting 238,000 pounds, equivalent to 300,000 on steady running. The cost of relining, using corundite, should be well under 40 cents per ton when the metal is poured at 1,150 to 1,200° C. If the furnace is to be used for delivering metal at 1,250 to 1,300° C. the roof part of the hearth and the upper part of the ends would probably last longer if constructed of zirkite, carborundum, or some other more refractory material, although these have drawbacks. Silica brick might serve in a furnace working 24 hours a day, but spalling of the bricks on cooling might prevent their use in a furnace working on a 10-hour schedule.

BEHAVIOR OF THE ARC.

As previously noted, when the arc was in series with sufficient reactance, surging was reduced and the stability was increased. With reactance any arc voltage from 105 to 140 volts, open current, or 95 to 125 volts under load, gave a well-behaved arc. On 220 volts, open current, with the amount of reactance used the arc was uncontrollable and had to be run at a very high current in order to make it hold, causing the power input to be far too high.

Within the range of suitable voltages the arc is "snappy" when the furnace is cold and will not give the normal power input until the inside of the lining is at low red heat. If the door is not tightly sealed, so that the gases can escape readily, the "snappiness" in the cold furnace is vastly increased, the arc apparently being blown out by the rush of gas. But when the furnace is at full running tempera-

ture the arc will run smoothly and quietly, even if the furnace is not tight. With the furnace hot and tightly sealed, the arc can not be heard.

The presence of a nonconducting vapor, such as oil vapor, makes the arc hard to hold. When oil is being driven off from an oily charge, there is a well-defined point at which the arc suddenly "catches" and begins to hold steadily, this being coincident with a sudden drop in the volume of the oil flame from the open spout and in the emission of soot.

Zinc vapor also has a marked effect on the arc. If an alloy of high zinc content is being melted and rocking is not started early in the heat, there comes a time when the arc suddenly takes a higher current and has to be lengthened in order to decrease the current and to keep the power input normal. The natural tendency is to draw the electrode out rapidly and too far, thus causing the arc to break. If rocking is started, the arc at once becomes normal, because when the charge is stirred less zinc vapor is produced and the superheating of the surface layer is prevented. If the angle of rocking is kept small, the phenomenon will be repeated at the point at which the roof begins to reflect heat more rapidly than the metal can absorb it, so that the surface again becomes superheated. Then, if the full rocking angle is used, the heat in the roof is taken up by the metal, stirring is again sufficient, and the arc becomes steady. Still later, in melting an alloy very high in zinc, the arc again shows signs of unsteadiness as the charge approaches the pouring temperature, because zinc vapor is then being given off from the thoroughly stirred charge and not merely from a surface layer. The unsteadiness increases with rising temperature. At about this time a tiny zinc flame may break through the luting of the door or, if the electrodes do not fit tightly into their holes, zinc flame may escape about the electrodes. The flame may or may not appear, according to the tightness of the electrodes and the door, but the behavior of the arc is a good guide as to whether or not a charge high in zinc has reached the proper pouring temperature.

For melting ordinary red brass the length of the arc at the end of the heat is normally about an inch, although it can be made longer or shorter without greatly affecting the power input. For alloys high in zinc the arc draws out to a length of 2 or 3 inches at the end of the heat and must be held at the proper length within more narrow limits. If the arc is too short, too high power will be drawn, and if the proper length is exceeded the arc breaks. On 220 volts the arc was drawn out at the end of the heat of yellow brass to more than a foot, giving too high a power input at any length short of that at which the arc would break.

The behavior of the arc in zinc vapor is what one would expect of an arc in a vapor that is a good electrical conductor, although some authorities state that zinc vapor is a poor conductor.

In melting alloys containing no zinc the arc is so short that the proper length is somewhat hard to maintain—the limits of a short circuit from one electrode to the other and of no circuit at all being close together—which again indicates that the zinc vapor, at least in low concentrations, acts as a good conductor. For alloys without zinc the use of a little flux—such as soda ash, common salt, or fluorspar—which will give off well-conducting vapors seems to aid in maintaining a stable arc. Flux does not have much effect on alloys very high in zinc, the arc acting about as it does in zinc vapor alone.

HEAT RETENTION.

When the furnace is running on a 10-hour basis and the last heat of the day's run has been poured at $1,150^{\circ}\text{C}$., the empty hearth will be at red heat, about 625°C . ($1,150^{\circ}\text{F}$.), or more on the next morning after standing 14 hours. If the furnace is kept closed it will be at about 100°C . after standing 48 hours. By taking out the door and the electrodes, the furnace would be cool enough for workmen to go inside for relining in about 60 hours. The time required for cooling could be reduced by blowing in air.

LACK OF STORED HEAT.

At the end of a heat, after the furnace has been rocked through the "full angle" of rocking, when the arc is stopped the temperature of the metal remains practically stationary, falling at the rate of about 2° to 3°C . per minute. By running the arc a couple of minutes every 10 or 15 minutes the metal can be kept molten for an indefinite period.

OUTPUT AND LABOR COST.

The furnace can be operated by one man, aided about one-third of the time by a helper in charging, the charges being delivered to the furnace and taken away by a separate pouring gang, as is done in attending to the coke-fired furnaces. In a 5-day, 50-hour, run on red brass or leaded bronze, half of which was on very bulky charges, 35,184 pounds was heated to an average temperature of $1,175^{\circ}\text{C}$. ($2,150^{\circ}\text{F}$.). Thus the output of the rocking furnace, at 66½ hours total labor, was about 525 pounds per man-hour. The coke-fired furnaces produced 5,850 pounds from three furnaces in 10 hours. One furnace tender can attend the three furnaces, and at least 1½ hours of a helper's time is required in wheeling coke, taking out ashes, and seeing to the recovery of metal from ashes. Therefore

the output is 5,850 pounds for 11½ man-hours, or about 510 pounds per man-hour.

It would be feasible to attach a motor to one electrode adjusting screw and control that electrode with an automatic device, such as the well-known Thury, Turnbull, or Seede regulators used on steel furnaces. Whether this procedure is advisable or not depends on conditions at any specific plant. If several furnaces were in use, automatic control would probably decrease the labor cost by reducing the number of skilled operators required. As the addition of an automatic control to the experimental furnace would have increased the cost of installation, and was not essential in a test to show the possibilities and limitations of the furnace, it was not tried. Use of such control would tend to hold a slightly higher power input and hence to decrease the power consumption and increase the output.

The operation of the rocking furnace requires a different and perhaps higher order of intelligence than the coke-fired furnaces, but the working conditions, through the elimination of the laborious work of charging coke and poking metal over the hot coke fire, are much superior. If male labor were provided for pouring, charging, and for replacing the electrodes if they should break, a girl could operate the furnace readily.

All in all, the labor cost per ton of output will not be any higher for the electric rocking furnace than for coke-fired furnaces.

CHARACTER OF METAL PRODUCT.

No difficulty was found in draining the furnace completely when changing from one alloy to another; that is, a charge is not contaminated by metal remaining from a previous charge of different composition if the furnace is properly drained and scraped.

No sand castings were made, nor were any physical tests made of the metal produced. All the metal melted was poured into ingot and went into the regular output of the plant. No ingots were rejected on inspection except in two melts. In one of these, a ladle of metal was not properly skimmed and dross fell on the ingot in pouring, giving a surface smooth in spots instead of uniformly rough. The ingots were melted again and poured with proper skimming and were then satisfactory. Another ladle was poured into new, cold molds, and the resulting ingots were rough. When remelted and poured into properly prepared molds, the ingots were satisfactory. In neither instance was the trouble due to the quality of metal produced.

On an alloy of 73 parts Cu, 4 Sn, 20 Pb, 3 Zn, the ingots were rather better as regards uniformity of lead content and freedom from "lead sweating" than were those from the coke fires.

Frequent analyses of the electric-furnace product were made at the start by the Michigan Smelting & Refining Co. laboratory. However, the chief chemist soon found that the results were uniform and showed less variation from the calculated composition than the metal from the coke fires, stated that the extra analyses were unnecessary, and requested that they be discontinued. Thereafter the electric output of any alloy was sampled as a part of the regular foundry output, analysis being of mixed samples from the electric and coke fires, except when some special information was desired.

The following examples are characteristic:

Characteristic analyses of samples.

Heat No.	Source.	Composition.			
		Copper.	Tin.	Lead.	Zinc.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
18-17	Composition sought	76	8	12	3
	Electric-furnace product	75.9	8.3	12.1	2.7
20-24	Composition sought	76	8	12	3
	Electric-furnace product	76.2	8	12.4	2.2
26-30	Composition sought	85	5	5	5
	Electric-furnace product	85.2	4.9	4.8	5
32-34	Composition sought	83	4	6	7
	Electric-furnace product	82.9	4.4	5.7	6.9
40-44	Composition sought	67	1	2	20
	Electric-furnace product	66.6	1	2	20.4
	Coke-furnace product	68.4	0.5	1.7	20.3
60-70	Composition sought	68	1	7	24
	Electric-furnace product	67.9			
	Coke-furnace product	69.9			
821	Composition sought	60	0	3	37
	Electric-furnace product	59.8			
822	Composition sought	60	0	3	37
	Electric-furnace product	59.7			
823	Composition sought	60	0	3	37
	Electric-furnace product	59.7			

METAL LOSSES.

As stated before, the metal-loss figures are merely comparative, the charges being oily borings and more or less dirty scrap, the actual metallic content of which was never exactly known.

In Table 4 the metal losses are given in the order in which the heats were made.



TABLE 4.—Data on metal losses.

Heat No.	Alloy.				Red borings.	Yellow borings.	Ingot.			Other material.		Total weight charged.	Weight of good ingot.
	Cu.	Sn.	Pb.	Zn.				Cu.	Pb.	Kind.	Weight.		
					Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.	Lbs.
1, 4-7	65½	...	2	32½	1,111	1,785	...	...	...	Fixtures	1,600	2,896	...
2-3, 8-11	83	7	4	6	1,400	2,465	...	...	...	Nickled brass	1,200	3,865	...
12-24	76	8	13	3	1,800	5,955	2,900	1,150	...	Radial or sections	800	11,805	11,371½
25-27	85	5	5	5	2,720	42	1,120	26	...	Zinc	42	3,908	3,645
28-30	85	5	5	5	...	3,704	1,120	...	...	...	...	3,704	3,635
31	84	8	4	4	...	1,288	...	...	...	...	...	1,288	1,268
33-34	83	4	6	7	1,620	280	600	80	40	...	...	2,620	2,393
35	76½	8½	12½	2½	230	720	254	106	...	...	...	1,310	1,319
32-35-44	67	1	2	30	4,000	896	...	...	...	Fixtures	1,600	...	...
45-53	84	7	8	1	11,600	...	...	...	...	Nickled brass	1,200	8,538	8,005
60	76	8	13	3	200	860	230	...	...	Radial or sections	800	...	...
62-63	76	8	13	3	...	...	...	...	...	Zinc	42	11,600	11,126
64	90	6½	1½	2	400	...	840	...	...	Fixtures	30	1,320	1,236
65	80	1	8	11	70	210	210	1-5	37	...	...	2,624	2,549
61, 66-70	68	1	7	24	100	2,210	350	333	134	Fixtures	100	64	1,304
71-77	78	3	7	12	4,560	868	...	1,458	150	...	...	632	610
78, 79	66	5	26	3	412	669	...	...	224	Foundry scrap	181	...	...
80-86, 89-92	73	4	20	3	3,298	7,800	434	1,682	...	Yellow brass	2,108	3,326	3,083
87-88	72½	6½	17½	3½	500	1,640	28	280	...	...	...	9,144	8,566
93	84	4	4	8	400	350	400	...	...	Yellow tubing	688	1,306	1,196
94-98	76	8	13	3	1,000	4,500	900	110	...	do.	124	14,392	13,918
99-110	72½	6½	17½	3½	4,800	7,080	2,344	1,600	...	Yellow tubing	320	2,612	2,576
111-127	67	1	2	30	5,600	...	...	...	...	Fixtures	24	1,306	1,264
128-129	76	8	13	3	1,370	20	870	758	348	...	...	6,530	6,294
130-131	83	4	6	7	1,000	320	720	572	...	do.	3,400	15,668	15,104
132-136	84	4	4	8	3,000	900	...	...	...	Nickled brass	1,400	10,800	9,935
137-141	85	5	5	5	3,150	400	...	2,430	120	Grindings (dust)	3,266	3,266	3,232
142-153	78	2	10	10	2,520	...	9,120	1,372	...	...	...	2,612	2,410
154-155	83	4	6	7	1,200	960	104	100	...	Babbitt borings	100	6,530	6,147
156-157	84	4	4	8	1,200	960	68	60	...	Foundry scrap	40	6,576	6,361
158-161	67½	4	26½	2	340	2,040	1,552	1,244	...	Fixtures	4,400	15,840	15,346
162	83	4	6	7	690	...	400	50	...	Babbitt	40	...	...
163	84	6	10	...	400	...	752	102	...	Yellow clipping	212	2,616	2,427
164-166	85	5	5	5	2,100	720	918	66	...	do.	292	2,620	2,308
167-173	68	1	7	24	2,625	...	805	210	...	...	...	5,224	5,080
174-182	79	9	10	2	6,300	3,780	478	644	...	Babbitt	40	194	1,304
183-186	67½	4	26½	2	1,720	960	1,720	1,240	...	Yellow clipping	154	1,306	1,265
187	67½	4	26½	2	...	...	...	...	...	do.	52	3,924	3,638
188-189	84	6	10	...	800	...	1,528	200	...	Fixtures	700	4,396	4,003
190	85	5	5	5	...	1,829	(c)	(c)	...	Babbitt	56	11,790	11,515
191	71½	1½	6	21	360	450	240	30	34	Tin	264	5,240	5,148
192-193	85	5	9	1	1,200	480	880	8	...	Babbitt	324	80	2,608
194-206	79	9	10	2	...	11,520	4,602	1,170	...	...	...	200	1,314
208	87½	5½	7	...	286	...	950	28	...	do.	60	2,628	2,528
207, 209-218	84	6	10	...	5,500	2,640	5,544	616	...	Babbitt	260	16,952	16,492
										do.	40	1,304	1,219
										...	...	14,300	14,041

• Not run.

• Gain.

REMARKS.

Heats 1, 4-7.—Loss includes soakage into fresh lining.
 Heats 18-24.—Lead had 2 per cent nonmetallic content.
 Heats 33-34.—Three per cent nonmetallic content; spilled badly in pouring.
 Heat 35.—Furnace not drained after heat 35.
 Heats 38, 39, 44.—One pot spilled badly.
 Heat 60.—Ladle would not hold all the metal.
 Heats 62, 63.—Details of charge not recorded.
 Heat 65.—Ladle would not hold all the metal.
 Heats 61, 66-70.—Borings very oily.
 Heats 78, 79.—Lining partly new; high loss from soakage.
 Heats 94-98.—Two hundred and thirteen pounds of skimmings, of unknown metallic content, and one heavy skull were not counted.
 Heats 111-117.—All skull; spill and drip not recovered; 12½ per cent oil in grindings.

TABLE 4.—Data on metal losses—Continued.

Gross loss.		Coke-fire loss on same charge.		Recovered metal, small ingot spill, etc.	Total weight of metal recovered.	Net loss not deducting oil and dirt.		Percentage of oil in borings.		Loss on sample pot borings.			Weight of charge less oil.	Net loss on charge, less oil.	Net loss.
Pounds.	Per cent.	Per cent.	Number of pots.			Pounds.	Per cent.	Yellow.	Red.	Yellow.	Red.	Weight of oil in borings.			
		(a)			Lbs.					P. ct.	P. ct.	Lbs.	Lbs.	Lbs.	P. ct.
.....	.....	(a)	.....	.....	2,699	1964	6.5	4.0	.....	.....	.....	42	2,851	152	5.3
.....	.....	(a)	.....	.....	3,753	1115	3.0	.....	4.5	.....	.....	63	3,802	484	1.3
4334	3.7	4.0	.....	1224	11,494	311	2.6	.....	1.0	.....	.....	41	11,764	277	2.4
263	6.7	8.4	.....	41	3,686	222	5.7	3.0	.....	12.7	5.2	.....	.....	.....	1.7
69	1.8	(a)	.....	6	3,641	63	1.7	.....	.....	.....	.....	.....	.....	.....	.....
20	1.5	(a)	.....	3	1,271	.....	1.3	.....	.....	.....	.....	.....	.....	.....	1.3
237	9.0	6.6	.....	127	2,520	100	2.9	4.0	3.0	.....	.....	74	2,546	26	1.0
59	3.7	4.1	.....	11	1,330	20	1.5	.....	3.0	.....	.....	6	1,304	26	2.0
580	6.6	8.0	.....	64	8,072	486	6.0	4.0	.....	9.9	.....	160	8,478	326	3.9
474	4.1	7.0	125	50	11,176	424	3.7	.....	1.5	.....	.....	174	11,426	2.50	2.2
84	6.4	6.3	79	51	1,287	33	2.7	.....	.....	.....	.....	.....	.....	.....	.....
75	2.9	10.7	.....	28	2,572	52	2.0	.....	.....	.....	.....	.....	.....	.....	.....
84	6.4	7.3	.....	40	1,263	41	3.1	.....	.....	.....	.....	.....	.....	.....	.....
42	6.4	14.1	11	40	650	2	0.3	.....	.....	.....	.....	.....	.....	.....	.....
243	7.5	9.3	11	68	3,151	175	5.3	.....	.....	.....	.....	.....	.....	.....	.....
278	3.0	5.9	17	84	8,950	194	2.1	.....	.....	.....	.....	.....	.....	.....	.....
110	8.4	2.7	93	29	1,225	81	6.2	.....	.....	.....	.....	.....	.....	.....	.....
474	3.3	3.7	220	54	15,972	420	2.9	.....	.....	.....	.....	.....	.....	.....	.....
36	1.4	4.2	.....	78	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
42	3.3	(a)	.....	10	1,274	32	2.5	.....	.....	.....	.....	.....	.....	.....	.....
286	3.6	3.9	30	184	6,478	52	0.8	.....	.....	7.7	3.7	.....	.....	.....	.....
564	3.6	3.7	147	70	15,474	494	3.2	.....	.....	.....	.....	.....	.....	.....	.....
865	8.0	(a)	.....	56	9,991	809	7.5	5.0	.....	.....	.....	330	10,470	479	4.6
34	1.1	5.5	90	15	3,247	19	0.6	.....	.....	.....	.....	4.0	.....	.....	.....
202	7.7	6.0	6	.....	.....	.....	.....	.....	.....	.....	.....	4.0	7.5	.....	.....
403	6.1	3.4	27	.....	.....	.....	.....	.....	.....	.....	.....	3.0	7.8	.....	.....
215	3.2	4.6	30	.....	.....	.....	.....	.....	.....	.....	.....	3.0	6.7	.....	.....
494	3.1	7.1	34	.....	.....	.....	.....	.....	.....	.....	.....	2.6	.....	.....	.....
189	7.7	7.2	58	55	2,482	134	5.1	.....	.....	.....	.....	8.1	.....	.....	.....
112	4.3	6.5	72	17	2,535	95	3.6	.....	.....	.....	.....	8.1	.....	.....	.....
144	2.8	3.0	56	18	5,098	126	2.4	.....	.....	.....	.....	2.1	.....	.....	.....
53	4.2	6.4	48	.....	.....	.....	.....	.....	.....	.....	.....	6.1	.....	.....	.....
41	3.1	4.0	39	.....	.....	.....	.....	.....	.....	.....	.....	6.1	.....	.....	.....
286	7.3	5.9	39	100	3,738	186	4.7	.....	.....	.....	.....	6.1	.....	.....	.....
393	8.8	6.7	35	72	4,075	321	7.3	.....	.....	.....	5.8	.....	.....	.....	.....
275	2.3	3.6	109	25	11,540	250	2.1	.....	.....	.....	4.0	.....	.....	.....	.....
92	1.7	3.6	82	.....	.....	.....	.....	.....	.....	.....	.....	5.3	.....	.....	.....
88	3.4	3.2	.....	60	2,584	28	1.1	.....	.....	.....	.....	2.5	.....	.....	.....
(d)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
165	12.6	6.6	70	108	1,257	57	4.3	.....	.....	.....	.....	6.0	6.4	.....	.....
100	3.8	3.5	102	9	2,537	91	3.4	.....	.....	.....	.....	.....	.....	.....	.....
460	2.7	3.1	112	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
85	6.5	(a)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
259	1.8	2.4	103	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Plus a little dirty scrap.

† Charge was all ingot from coke fires that would not pass requirements on account of lead segregation. Passed after being melted in electric furnace. Charge not weighed.

REMARKS—Continued.

Heats 128-129.—Spill and skull not recovered.

Heats 130, 131.—Spill and skull not recovered; ingots counted up shy.

Heats 132-133.—Twenty-three pounds of dross, containing some metal, was not counted.

Heats 156, 157.—Large slug.

Heats 158-161.—No ladle drip recovered.

Heats 164-166.—Skull metal included in 185 pounds; skimmings not included.

Heats 167-175.—Borings oily, from bottom of pile.

Heats 174-183.—Some of the drip, spill, etc., was not recovered.

Heats 183, 186.—No drip, etc., recovered.

Heats 186-193.—Skulls and drip not included; 86 and 84 per cent Cu ingots mixed in shipping room; heavy skulls, cold ladles.

TABLE 5.—Metal losses in electric-rocking furnace and in coke-fired furnaces compared.

Reference No.	Heat No.	Cu.	Sn.	Pb.	Zn.	Weight charged.	Gross loss, electric furnace.	Net loss, electric furnace.	Foundry gross loss, same charge.	Excess gross loss of coke over electric melting, or savings by electric on gross loss.		Excess gross loss of electric over coke melting.	Orig. weight ingot and drip not slug. ³	Recovered spill and drip not fed back.	Ladle skulls, approx. make weight.	Skimmings containing machine metallics shot.
										Pounds.	Per cent.		Pounds.		Pounds.	Pounds.
1	64	90	64	14	3	1,304	6.4	3.1	7.3	0.9	12	.....	40	3	.....	.....
2	25-27	85	5	5	5	3,098	6.7	5.7	8.4	1.7	62	.....	15	23	.....	.....
3	137-141	85	5	5	5	6,576	3.2	.....	4.6	1.4	82	.....	.....	.....	.....	.....
4	164-166	85	5	5	5	3,924	7.3	4.7	5.9	.....	.....	1.4	.....	.....	c 100	138
5	192-193	85	5	9	1	2,028	3.8	3.4	3.5	.....	.....	0.3	.....	.....	.....	c 19
6	45-53	84	7	8	1	11,000	4.1	3.7	7.0	2.9	336	.....	14	36	.....	.....
7	103	84	6	10	.....	1,206	3.1	.....	4.0	.....	.....	.....	.....	.....	.....	.....
8	188-190	84	6	10	.....	2,612	3.4	1.1	3.2	.....	.....	.....	.....	.....	c 60	.....
9	207, 210-218	84	6	10	.....	14,300	1.8	.....	2.4	.....	.....	.....	.....	.....	.....	.....
10	132-136	84	4	4	8	6,580	6.1	.....	3.4	.....	.....	2.7	(c)	(c)	(c)	/ 238
11	154-157	84	4	4	8	2,020	4.3	3.6	6.5	2.2	57	.....	11	.....	.....	.....
12	130-131	83	4	6	7	2,612	6.0	.....	7.7	1.7	43	.....	.....	.....	.....	.....
13	164-155	83	4	6	7	2,616	7.7	5.1	7.2	.....	.....	.....	.....	.....	.....	.....
14	162	83	4	6	7	1,304	4.2	.....	6.4	2.2	29	.....	.....	.....	.....	.....
15	65	80	1	8	11	652	6.4	3	14.1	7.7	41	.....	40	.....	.....	.....
16	174-182	79	9	10	2	11,790	2.3	2.1	3.6	1.3	153	.....	.....	25	.....	.....
17	194-206	79	9	10	2	16,952	2.7	.....	3.1	.....	.....	.....	.....	.....	.....	.....
18	142-153	78	2	10	10	15,840	3.1	.....	7.1	4.0	634	.....	.....	.....	c 60	.....
19	71-77	78	3	7	12	9,144	2.0	.....	5.9	2.9	265	.....	10	14	.....	.....
20	12-24	78	8	13	8	11,805	2.7	2.4	4.0	.....	.....	.....	.....	.....	.....	.....
21	60	76	8	12	24	1,320	6.4	2.7	4.0	.....	.....	.....	11	48	c 63	.....
22	62-63	76	8	12	24	2,624	2.9	2.0	10.7	7.8	204	.....	.....	.....	.....	.....
23	94-96	76	8	12	24	6,580	3.6	.....	3.9	.....	.....	.....	.....	.....	c 104	.....
24	128-129	76	8	12	24	3,266	1.1	.....	5.5	4.4	143	.....	.....	.....	.....	.....
25	80-85	76	4	20	8	14,302	3.3	2.9	3.7	.....	.....	.....	.....	.....	.....	.....
26	87-88	72	6	17	3	2,612	1.4	.....	4.2	.....	.....	.....	.....	.....	.....	.....
27	98-100	71	12	6	21	15,668	3.6	3.2	3.7	2.8	78	.....	.....	.....	.....	.....
28	191	68	1	7	24	1,314	4.3	.....	6.6	.....	.....	.....	.....	.....	.....	.....
29	61, 66-70	68	1	7	24	3,236	7.5	4.3	9.2	1.5	63	.....	.....	.....	.....	.....
30	167-178	68	1	7	24	4,386	3.8	7.3	6.7	.....	.....	2.1	.....	.....	.....	.....

[illegible]

2,792	519
506	394

519
894
792
508

31

Net saving on gross loss,	2,286 pounds=1.15 per cent.	—
1,340	Scrap recovered, 1,340 pounds=0.65 per cent.	

Total saving, 3,626 pounds—1.8 per cent.

Recovery of metal from skimmings. Recovered spillings, drippings, and small ingot, that is, all pourable metal, credited; no allowance made for oil, dirt, or metal recoverable from skimmings. Light or excess weight ingots and slugs, poured into "niggerhead" in draining furnace when ladles would not hold all the metal not fed back.

Light or excess weight freels and slugs. poured into "netherhead" in draining furnace when ladles would not hold all the metal not fed back.

• Much metal shot in dress.

● Weight not obtained.

Much dross from carbon

● **Ladle would not hold all the metal; heavy skull in cold ladle.**

'Ladle would not hold all the metal;

These two heats were made immediately after partial relining,

In Table 5 have been collected the results of runs on material which was also melted in the Michigan Smelting and Refining Co. coke-fired furnaces. These alloys have been arranged in order of copper content and for each alloy that was made from a different lot of raw material separate entries have been made. Each entry, then, may be considered as the result of a separate test of the electric furnace, as compared with the coke-fired furnaces, on a definite charge. Of the 34 tests the electric furnace shows a lower gross loss, or difference between weight of charge and weight of good ingot, in 25 tests and the coke-fired furnace in 9 tests. Of the 9 tests, in those designated by reference Nos. 4, 8, 13, 21, and 28, the excess loss is due to the ladles being so cold as to skull badly or not being large enough to empty the furnace completely, neither condition being the fault of the furnace. Among the other four tests are the two designated Nos. 5 and 11, in which the excess loss in electric melting compared with coke melting is due to the retention of metal in dross. With a little more experience such losses could doubtless be reduced. In the test designated as reference No. 30 the larger part of the excess loss is offset by metal poured out because the ladle would not hold it all, and the rest, about 0.7 per cent, is accounted for by the fact that the borings used were very oily. The top of the pile had been run in the coke-fired furnaces, leaving the bottom borings, into which oil had run down, for the electric furnace. The oily condition of the borings is reflected in the high gross loss figures in both types of furnace. In the test designated as reference No. 34 the excess loss is due to soakage into a fresh hearth. However, without making any allowance for the exceptions mentioned, on 102 tons the electric furnace returned 2,286 pounds, or 1.15 per cent more good ingot than the coke fires.

On account of the many short runs in the electric furnace, the small ingot and metal poured into "niggerhead" because the ladle would not hold it all could not always be fed back into the furnace. In regular operation such metal would be fed back at once or stored for future use, and would not be a loss. The same applies to the spillings. With properly preheated ladles skulling would be reduced to a minimum. The 1,340 pounds of small ingot, "niggerhead," slugs, spill, and skull not fed back would raise the savings—as compared with coke-fired furnaces—to 3,626 pounds, or 1.8 per cent. This does not include any metal that had soaked into the hearth and would be recovered when the lining was torn out.

Even in the longer runs with the coke fires a certain amount of drip from pouring the last pots was not fed back, and hence is not credited to the coke fires in the above tabulation. But in many of the electric-furnace runs there was pouring drip which was not fed back, skulls not credited, etc., so that the above comparison is fair.

It is noteworthy that the comparisons where the coke fires showed a lower gross loss were all with the shorter runs in the electric furnace, where inability to feed back the scrap affects the figures most. In no instance of a run of 7,000 pounds or more did the electric furnace fail to show a lower gross loss.

Of course, in this comparison the amount of metal recoverable from the ashes of the coke fires is not taken into account. However, as such metal has to be put through the concentrating plant and then smelted for copper content, its amount balanced against the cost of its recovery and the loss of metals other than copper will by no means make up for the balance in favor of the electric furnace.

Broadly speaking, the higher the zinc content of the alloy, and the larger the proportion of borings in the charge, the greater is the metal saving in electric melting compared with melting with coke fires.

RUNS ON EXTRUSION METAL.

It would seem logical, then, to attempt to extend the application of the rocking furnace to rolling-mill alloys, such as cartridge and shrapnel brass, extrusion metal (a brass from which extruded shapes are made), etc., and to manganese "bronze," the latter containing about 42 per cent zinc.

Through the courtesy of the Detroit Copper & Brass Rolling Mills, which supplied the material, a few heats (Nos. 54-59) were made on extrusion metal, with 36½ per cent zinc. As the results of these tests showed a distinct limitation in the furnace as at first designed and operated, they are described below.

RAW MATERIAL.

The raw materials were rod ends containing Cu 61, Zn 36.5, and Pb 2.5 per cent; "sawdust" (saw cuttings) containing Cu 60, Zn 38.5, and Pb 1.5 per cent, with 4 per cent water from cutting compounds; copper scrap; lead scrap; and spelter.

HEAT 54.

The furnace lining had been thoroughly scraped at the end of the previous day's run. The temperature was 1,020° F. (550° C.) at 5.30 a. m. The furnace was preheated from 6 to 6.30, using 84 kilowatt hours, before charging.

The charge was 400 pounds wet sawdust (384 pounds on dry basis) 400 pounds of rod ends, 248 pounds of copper scrap, 160 pounds of zinc, and 12.5 pounds of lead; total, 1,204.5 pounds. This composition allows 1½ per cent zinc for loss, the same as is allowed for melting with coke fires, over the desired alloy of 61 per cent copper, 36½ per cent zinc, and 2.5 per cent lead.

At 6.48 a. m. the sawdust was charged on the bottom, then the rod ends, and then the copper. The arc was turned on at 7.08; "safe

rocking" was begun at 7.55. The charge had all melted at 8.17, after 154 kilowatt-hours had been used. The melt was splattered and the lead added at 8.33, after 179 kilowatt-hours had been used. "Full rocking" was started at 8.40. Pouring was begun at 8.53, and finished at 9.01. The power consumption was 194 kilowatt-hours, plus 5 for the motor driving the rocking device, or 199 in all. The temperature was 1,940° F. (1,060° C.). There was recovered 1,147 pounds of billet; hence the loss was 4.7 per cent on the dry basis. The furnace was not scraped. Some zinc was lost in splattering with the door open. No trouble of any sort was encountered. The arc was on 1 hour and 16 minutes, the total time elapsed being 2 hours and 13 minutes. The poured metal analyzed: Copper, 62.01 per cent; lead, 2.70 per cent; zinc (by difference), 35.29 per cent, or 2.8 per cent loss by analysis.

HEAT 56.

The charge was similar and was charged in the same manner as in heat 54. Charging was started at 9.04 a. m.; the arc was turned on at 9.14. At 9.37, after 60 kilowatt-hours had been used, one electrode stuck tight and broke off when an attempt was made to pull it out. Zinc and zinc oxide had condensed in the clearance between the electrode and the electrode hole, and as the chilling effect of the cold charge extended along the electrode through the lining, the molten zinc, that had condensed there during splattering on the previous heat, froze and soldered the electrode tightly in place. Barring out the broken electrode, scraping out the zinc and zinc oxide, and replacing the electrode caused 36 minutes delay; during this time the charge, which had begun to melt on top, froze into a practically solid mass, very hard to melt. "Safe rocking" was started at 10.26, after 100 kilowatt-hours had been used, including power required for the motor. "Full rocking" was begun at 10.52, after 160 kilowatt-hours had been used. At 10.58 the charge was splattered and the lead added. The arc was turned on again at 11.03 and was turned off at 11.08, when 188 kilowatt-hours had been used. The temperature was 1,975° F. (1,080° C.). Pouring was delayed on account of waiting for the crane, so from 11.16 to 11.24, 9 kilowatt-hours was used, including power for the motor, or 197 in all. The furnace was poured at 11.48 to 11.51, and was not drained; 1,096 pounds of ingot and 16 pounds of spillings were recovered, the apparent loss on the dry basis being 8.9 per cent. The metal analyzed: Copper, 62.75 per cent; lead, 2.65 per cent; zinc (by difference), 34.60 per cent, or 3.5 per cent loss by analysis.

HEAT 56.

In heat 56 the charge was 800 pounds of "sawdust" (768 on dry basis) 252 of copper, 165 of zinc, 18 of lead, total 1,203 pounds, calculated for 2.75 per cent excess zinc content, as would be used in coke-fired furnaces working on such a charge. Charging was started at 11.54, the "sawdust" being charged first, then the copper. The arc was turned on at 12.05 p. m. At 12.24, after 47 kilowatt-hours had been used, the operator intended to start "safe rocking," but had neglected to change the control from "full rocking." Both electrodes were broken, causing a delay of 55 minutes, and the charge had stuck together into a rather solid mass that was hard to melt. At 1.33, when 75 kilowatt-hours had been used, "safe rocking" was started. At 2.21, power consumption 165 kilowatt-hours, there was some solid copper and much molten metal; at 2.34, 175 kilowatt-hours used, "full rocking" was started. Some of the copper was still solid and fell on one electrode, breaking it. A delay of 29 minutes for replacing the electrode resulted, the furnace being open most of the time. At 3.12 "full rocking" was resumed; at 3.14, when 202 kilowatt-hours had been used, the charge was splattered and the lead added. As the operator had to wait for the crane, the arc was left off until 3.30, then it was run until 3.37. The furnace was poured at 3.45 to 3.57. The temperature was about 1,975° F. (1,080° C.). Much greenish dross, high in metallic content, was scraped out. The arc was on 1 hour and 32 minutes; the total time was 4 hours and 3 minutes. There were poured 1,141 pounds of ingot and 20 pounds representing spill, sample for analysis, and skull. The metal analyzed: Copper, 63.95 per cent; lead, 2.74 per cent; zinc (by difference), 32.31 per cent, or a 6 per cent loss by analysis.

HEAT 57.

The furnace had cooled over Saturday and Sunday. The long electrode cooler was removed from one electrode and was replaced with a copper coil. Monday morning 300 kilowatt-hours was put in. At 5.30 a. m. on Tuesday, the temperature was 700° F. (370° C.). From 6 to 6.33 the furnace was preheated with 102 kilowatt-hours. At 6.38 charging was started. The charge comprised 800 pounds of sawdust (768 on dry basis) 252 of copper, 200 of zinc (4½ per cent excess), and 18 of lead; total, 1,238 pounds. Half of the sawdust was placed on the bottom, then all the copper was added. At 6.47 the arc was turned on; at 7.15 after 75 kilowatt-hours had been used, "safe rocking" was started; at 7.33, 130 kilowatt-hours used, the rest of the borings were charged. At 7.56, 150 kilowatt-hours used, "safe rocking" was begun. At 8.31, 220 kilowatt-hours used, the charge was

speltered and the lead added. At 8.40 the arc was turned on again, and full rocking was resumed. At 8.44 the temperature was 1,825° F. (1,000° C.), and the arc was shut off, as the caster said it was hot enough. Pouring was begun five minutes later, and was finished at 8.53. The dross was scraped out. The arc was on 1 hour and 24 minutes; the total time elapsed was 2 hours and 15 minutes. There was no trouble from electrodes sticking in this heat. The furnace had used 230 kilowatt-hours, and the motor 4, total 234. There was poured 1,155 pounds of metal, showing a loss of 5.9 per cent. The metal analyzed: Copper, 61.35 per cent; lead, 2.74 per cent; zinc (by difference), 35.91 per cent, or 5 per cent loss by analysis.

HEAT 58.

In heat 58 an attempt was made to melt sawdust with the use of less zinc than was required by the previous charges. The charge comprised 1,200 pounds of sawdust (1,152 on dry basis) 20 of zinc, 18 of lead, and 8 of spillings from heat 57; total, 1,208 pounds; it was calculated for 3 per cent excess zinc content. Charging was started at 8.58 a. m., with about half of the sawdust in. The arc was turned on at 9.05 a. m. At 9.13 the electrode with the coil cooler stuck fast. The electrode was not moved but the coil was pulled back so the electrode would heat up, and the arc was adjusted with the other electrode. At 9.30, when 65 kilowatt-hours had been used, "safe rocking" was started. At 9.34, the other electrode, the one with the long cooler, stuck fast and was broken in an attempt to free it. The broken piece was rammed out and replaced. The other electrode had loosened. More borings were charged; this was unwise as the charge froze solid. At 10.41, after 130 kilowatt-hours had been used, the balance of the borings was charged. "Safe rocking" was begun at 11.02. The metal was still solid at 11.33, but all of it was molten at 11.48, after 220 kilowatt-hours had been used. Then the melt was speltered through the spout.

The rocking motion was changed from "safe" to "full" rocking at 11.55. At 12 the arc was shut off; the furnace had taken 233 kilowatt-hours and the motor 4, total 237. The temperature was not taken, but the caster said it was hot enough. At 12.12 the operator finished pouring and scraped out much dross, high in metallic content. The time was as follows: Total time elapsed, 3 hours 14 minutes; arc on, 1 hour 33 minutes; delay, 42 minutes; charging, pouring, and looking to see state of metal, 59 minutes. There was poured 1,030 pounds, showing 14.7 per cent loss on dry basis, or 18 per cent on wet basis. The metal analyzed: Copper, 64.20 per cent; lead, 2.94 per cent; zinc (by difference), 32.86 per cent, or 8.1 per cent loss by analysis.

HEAT 59.

The metallic material of the charge comprised 750 pounds of wet borings (720 on dry basis), 25 of rod ends, 18 of zinc, and 9 of lead; total, 772 pounds on the dry basis; it was calculated for a 3 per cent excess zinc content. At the start the 750 pounds of wet borings and 5 pounds of soda ash as flux were charged. The flux was added on account of the formation of much dross in the preceding heats. At 12.12 the arc was turned on, and at 1.06 "safe rocking" was started, after 46 kilowatt-hours had been used. From 1.14 to 1.20 (6 minutes) the arc was off, and a fresh grip was taken on one of the electrodes, as they had worn enough to require this. At 1.34, 84 kilowatt-hours used, the rest of the charge, comprising 25 pounds of rod ends, 18 pounds of zinc, and 9 pounds of lead, was added through the spout. As the plant water supply had temporarily failed, there was no water for electrode cooling. An attempt was made to pour the metal but it was too cold. The arc was turned on again at 1.56 and at 2.09, when 114 kilowatt-hours had been used, "full rocking" was begun. The charge was poured at 2.24, after 144 kilowatt-hours had been used on the arc and 3 on the motor, total 147. There was poured 688 pounds of ingot. The total quantity of metal poured was 691 pounds, showing 11 per cent loss on the dry basis, or 14.2 per cent on the wet basis. The metal analyzed: Copper, 64.50 per cent; lead, 2.70 per cent; zinc (by difference), 32.80 per cent, or 6.7 per cent loss by analysis. At the end of the heat the electrodes were red outside the furnace through lack of water cooling. The electrode with the spiral-coil cooler was loose and the other was stuck.

GENERAL RESULTS OF THE SIX HEATS.

A summary of the results of the heats of extrusion metal is given in the table following:

Summary of results of heats 50 to 59.

Heat No.	Sawdust.		Water in sawdust.	Rod ends.	Copper.	Zinc.	Lead.	Clean metal poured.	Dross.
	Wet basis.	Dry basis.							
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
54.....	400	384	16	400	248	160	123	1,147	
55.....	400	384	16	400	248	160	123	1,112	
56.....	800	768	32	.....	252	165	18	1,161	= 111
57.....	800	768	32	.....	252	200	18	1,165	
58.....	1,200	1,152	48	b 8	.....	30	18	1,030	= 84
59.....	750	720	30	25	.....	18	9	691	
Total.....	4,350	4,176	174	833	1,000	733	88	6,306	= 195
2,654								90	
7,004 (wet basis) 6,830 (dry basis)								6,396	

a Some of the dross was not recovered.

b From heat 57.

c Assay showed metallic content of 46 per cent, or 90 pounds.

The table shows that from a charge of 6,830 pounds of metallic material, with 114 pounds of water, or 7,004 pounds total weight, there was recovered 6,306 pounds of clean metal and 90 pounds of metal recoverable from dross, or 6,396 pounds in all. Thus the actual metal loss was $6,830 - 6,396 = 434$ pounds, or 6.3 per cent, based on the metallic content of the charge. The gross loss, based on the weight of wet charge, 7,004 pounds, to clean metal, 6,306 pounds, is 698 pounds, or 9.9 per cent.

This loss seems very high. As no companion runs were made on these mixtures in the coke fires, the Detroit Copper & Brass Rolling Mills later ran a pot of wet borings alone in a coke fire and got 18 per cent gross loss. This result may be compared with those of heats 58 and 59, where 1,950 pounds of wet borings and 127 pounds of other material was charged, and 1,721 pounds of clean metal was poured. Then, assuming no loss on the material other than borings, $1,721 - 127 = 1,594$ pounds would have been poured. Hence, the gross loss on the borings would be 356 pounds, or 18.3 per cent.

For all six heats, no loss being assumed on the 2,654 pounds of material other than borings, 4,350 pounds of borings would have given $6,306 - 2,654 = 3,652$ pounds, or a gross loss of 698 pounds, or 15 per cent.

That is, the gross losses, although large, are about the same as in the coke fires, and seem to be due to the presence of the cutting compound. The water in the borings was 2 to 6 gallons per heat.

The representatives of the Detroit Copper & Brass Rolling Mills stated that the metal losses on its material were not excessive, considering the nature of the material, and said that the furnace would be promising for use on such an alloy if the mechanical difficulties were overcome.

Inasmuch as electrode troubles interfered with heats 55, 56, and 58, requiring the furnace to be opened and the arc to be left off for considerable periods, higher losses would be expected on these heats. The 100-pound capacity laboratory furnace melted 30 per cent zinc ingot, manganese-bronze borings, and German-silver scrap without trouble and with lower losses than those in fuel-fired furnace practice. Little speltering was done in the laboratory furnace, heat L24 being the only one in which much spelter was used. The original notes on the laboratory experiments were burned in the fire at Cornell University that destroyed the office used by the Bureau of Mines. The reports prepared on these experiments do not mention any trouble from the electrodes sticking. It is recalled that in one run, probably heat L25, the electrodes did show signs of sticking, but no trouble was experienced which prevented satisfactory operation of the small furnace, or seemed to call for special comment.

The electrodes were not water-cooled and probably ran hotter than those in the larger furnace after water-cooling was used.

As is shown by results of tests designated by reference Nos. 28, 29, 33, in Table 2 (p. 39), the larger furnace melted yellow scrap, no spelter being added, of 21, 24, and 30 per cent zinc content without difficulty and with lower losses than the coke-fired furnaces.

The difficulties in heats 54 to 59 seemed to be caused entirely by the sticking of the electrodes through deposition of the zinc vapor that was evolved when large amounts of spelter were being added to the hot charge. Less trouble was encountered in melting 30 per cent zinc scrap in the electric furnace than in melting a 20 per cent zinc brass (also without speltering) in the Rennerfelt furnace, from personal observation of the Rennerfelt and from reports received on its operation. The Scoville Manufacturing Co. reports that trouble was encountered in the electrodes sticking in their experiments on melting yellow brass in a Stassano-type furnace.

In the rocking furnace no trouble was met from electrodes sticking when melting alloys with a high lead content, even as much as 26 per cent lead, although with the Rennerfelt furnaces at Chicago, in melting alloys containing less than 15 per cent lead, so much trouble was caused from the electrodes sticking, and as a result, breaking, that large openings were made about the electrodes and no attempt was made to keep the furnaces tight. On alloys ranging up to 30 per cent zinc content, made from previously alloyed material, there was no trouble, provided rocking was started early enough in the heat, the power input was not allowed to go too high, the charge was held down to not more than 1,200 pounds, or, better still, to 1,000 pounds, and the metal was not allowed to get much hotter than the proper pouring temperature. If any of these precautions, neglect of which tends to the production of excessive zinc vapor in the furnace, was overlooked, there was a slight tendency for the electrodes to stick. This sticking could always be overcome by cutting down the flow of electrode cooling water and thus allowing the electrodes to run hotter and keep the condensed zinc molten.

When any condensation has taken place, it is wise to remove the electrodes at the end of the day and scrape out the holes with a 4-inch reamer while they are still hot. Otherwise, freezing of the condensed zinc might cause the electrodes to be stuck the next morning. On 24-hour operation this would not be required.

Hence the furnace worked satisfactorily on charges high in volatile metals, except when much metallic zinc was added to a hot, molten charge.

It would be desirable to attempt reversing the usual order of charging, putting the zinc into the hot furnace first, and then the scrap brass and copper, in the hope that the melted zinc would take

up enough brass and copper to raise its vapor pressure before the temperature rises to the boiling point of zinc. This is understood to be the regular practice in the electric-furnace work of the Scoville Manufacturing Co.

For satisfactory operation of the furnace on alloys requiring the addition of much spelter, an electrode packing or stuffing box that would keep the electrode gas-tight but still free to move would have to be devised.

The Michigan Smelting & Refining Co. made no yellow brass with the use of large amounts of spelter at the time of the first test, hence to test the making of such alloys in the large rocking furnace was impracticable. Also the Bureau of Mines laboratory equipment was needed for other and more pressing work, and time for such tests was lacking.

Hence, it seemed best to continue the test of the rocking furnace on the types of alloys made by the company, and postpone to a later time the study of its application to alloys requiring the addition of much spelter. Pending results of such work the rocking furnace as designed and operated had to be rated as not successful in handling this 36½ per cent zinc alloy when 160 or more pounds of spelter was added as such.

However, tests made in 1918, both on the laboratory furnace and on the furnace at Detroit, showed that the troubles met in runs 54 to 59 could be eliminated.

TESTS ON YELLOW BRASS IN LABORATORY FURNACE USING SPELTER.

After the first series of tests of the large rocking furnace at Detroit was completed, a further series of tests was made with the laboratory furnace to study the sticking of the electrodes when spelter is added. The laboratory furnace had been entirely dismantled to make room for other furnaces, and brick of the size previously used in the lining were not at hand, so the hearth was made 12 inches in diameter by 12 inches long, which reduced the capacity of the furnace. The roof part of the lining was of "corundite" circle brick, the rest was ordinary fire brick. Spiral coils of copper tubing were used outside the furnace for electrode cooling, in order to make conditions more nearly like those in the large furnace.

The electrodes were first introduced through holes that were lined with alundum cement and closely fitted the electrodes, leaving as small a clearance as would permit the electrodes to move readily. Heats L53 to L57 were made on various manganese alloys, these being for another investigation.

TESTS WITH ELECTRODES PASSING THROUGH REFRACTORY WALLS.**SPELTERING LAST.****HEAT L58.**

This was a wash heat, to clean the furnace and saturate the lining with copper. Four large copper ingots weighing 90.7 pounds were charged into the cold furnace. The arc was turned on, and after heating 40 minutes, when 25 kilowatt-hours had been used, rocking was begun at the "safe rocking" angle and was gradually increased to "full rocking." After 1 hour and 18 minutes, total time, the furnace was at 1,250° C. and was poured. The total power consumption was 35 kilowatt-hours. As a result, 89.5 pounds of metal was recovered, showing a loss of 1.2 pounds (1.35 per cent) from metal soaking into the hearth or being retained in the furnace. A little charcoal was used in this and in all subsequent heats.

HEAT L59.

Sixty pounds of copper ingot was charged into the hot furnace. Rocking was started after 15 minutes, when 12.25 kilowatt-hours had been used. The arc was run for 20 minutes, total time. The power consumption was 14.25 kilowatt-hours and the temperature was 1,300° C. The melt was cooled 10 minutes with the door open (after adding charcoal) to 1,175° C., then speltered with 32 pounds of zinc. Then rocking was resumed, the arc run 1 minute, using 0.75 kilowatt-hour, total 15 kilowatt-hours, and the furnace was poured at 1,075° C. There was obtained 89.9 pounds of metal, showing a loss of 2.1 pounds (2.33 per cent).

HEAT L60.

Thirty pounds of copper ingot and 45.1 pounds of brass from heat L59 were charged into the hot furnace. After 14 minutes heating, when 8 kilowatt-hours had been used, rocking was begun, and after 22 minutes, 11 kilowatt-hours used, the temperature was 1,200° C, and the metal was jumping. At this time 3.4 pounds of brass ingot was added, then 16.5 pounds of zinc. Then the furnace was started rocking again, and the arc was run for 1 minute longer, when 0.25 kilowatt-hour, or a total of 11.25 kilowatt-hours, had been used and the temperature was 1,075° C. The amount of metal recovered on pouring was 95.2 pounds, indicating an apparent gain of 0.2 pound.

The electrodes did not stick during these three heats. After this run the holes and the electrodes were not cleaned, but were left undisturbed overnight, no effort being made to work them loose. In the morning they were rather tight, but could be moved without difficulty. Some zinc oxide and a few tiny globules of metallic zinc

adhered to the electrodes, there being more on the one used for adjusting the arc. This electrode is moved oftener and hence tends to enlarge the hole faster than the other electrode does.

SPELTERING FIRST.

HEAT L61.

To preheat the furnace before making brass, 90 pounds of copper ingot was charged into the cold furnace. The arc was turned on, and the furnace rocked as usual; time, 55 minutes; power consumption, 35 kilowatt-hours; pouring temperature, 1,290° C. There was obtained 90.5 pounds of ingot, showing 0.5 pound gain. The excess was evidently from brass clinging to the lining after heat L60.

HEAT L62.

Twelve minutes after the arc was stopped on heat L61, charging was started; 21.6 pounds zinc, in six pieces, 29.6 pounds of brass from heat L59, in three ingots, and 40 pounds of copper electrotypes, soldering-iron heads, and heavy wire was charged. The zinc was placed on the bottom, the brass above that, and the copper next the arc. Nine minutes after charging was started the arc was turned on. The furnace was rocked through a small arc from the very start of the heat. In six minutes a few slight puffs of zinc smoke escaped about the electrodes; smoke escaped at intervals up to 17 minutes, by which time the rocking angle had been increased to "full rock," when the furnace was perfectly tight. Thirty minutes after the arc had been started it was stopped, 12½ kilowatt-hours having been used. When the door was opened clouds of zinc smoke were emitted. The temperature was 1,120° C. and the metal was jumping violently. In all, 89.7 pounds of metal was poured; a few drops of zinc oozed out at the adjusting electrode.

HEAT L63.

In this run 21.7 pounds of zinc, in seven pieces; 31 pounds of ingot from heat L60, in three ingots; 21.4 pounds of copper, in four ingots; and 19 pounds of copper scrap were charged. The zinc was placed at the bottom, and the copper at the top, as before. The arc was started 15 minutes after it was off on heat L62. Rocking through a small angle was begun at once, and the angle was gradually increased. Slight fumes were emitted about the electrodes after about 10 minutes, but these soon ceased and the furnace ran absolutely tight. No further oozing out of zinc was noted. After the arc had run 30 minutes, using 11.75 kilowatt-hours, the metal was poured at 1,065° C. Including buttons taken from the furnace the next morning, 92.9 pounds of metal was obtained.

At the end of this heat both electrodes were perfectly free, although metallic zinc could be seen about the adjusting electrode at a couple of points. Next morning both electrodes were tight. The non-adjusting electrode could be moved without using much force, but a pipe wrench had to be used to take out the adjusting electrode. There were only a few tiny globules of zinc on the nonadjusting electrode, but more on the adjusting one, and all the irregularities and depressions in the hole in the refractory end wall were filled with zinc. There was very little oxide coating on either electrode.

The scheme of charging the spelter at the start worked well. The condensation of zinc in heat L62 was probably due to overheating at the end, the metal being too hot. Also, probably from the overheating, the electrodes were stuck tighter the next morning than they were after heats L59 and L60, yet there was no sign that any great excess pressure of zinc vapor was created through charging spelter at the start. There was no further metal loss.

The method of charging the zinc first has the following advantages. Metal loss in speltering is avoided, heat is saved by not having to open the furnace for speltering, time is saved, and elimination of the fume of speltering decreases the likelihood of the furnace tender getting brass "shakes." Seemingly the method should not cause any more electrode trouble than is caused by speltering last, and it should certainly be used where possible.

TESTS WITH ELECTRODES PARTLY INCLOSED IN GRAPHITE SLEEVES.

In order to try the effect of a graphite sleeve about the electrode, sleeves of Acheson graphite were made. These were about 3 inches in outside diameter, 2 inches in inside diameter, and 4 inches long, and gave just enough clearance to slip readily over the electrodes. On one end (No. 1) a sleeve was inserted 2 inches into the refractory lining, so that the electrode passed through 7 inches of alundum lining inside the furnace, and then through 4 inches of graphite sleeve, 2 inches of which extended outside the furnace. On the other end (No. 2) the wall was so cut away that the electrode passed through 4 inches of alundum lining on the inside, then through the 4 inches of graphite sleeve.

HEAT L64.

After the furnace had been preheated empty for 17 minutes, using 10 kilowatt-hours, 83.3 pounds of brass ingot from heat L63, and 0.8 pound zinc were charged. The arc was run 34 minutes, using 18.5 kilowatt-hours. Rocking was begun 13 minutes after the arc started, when 7 kilowatt-hours had been used. The metal was poured at 1,050° C., 80.9 pounds of ingot being obtained. No fumes escaped about the electrodes.

HEAT L65.

Into the hot furnace was charged 21.1 pounds zinc, then 30 pounds brass ingots from run L60, then 40 pounds of copper (about 30 pounds in 10-pound ingot, balance scrap). Rocking was begun early in the heat. The arc was run 28 minutes, using 12.5 kilowatt-hours, and the metal poured at 1,060° C. No fumes escaped. The amount of metal recovered was 90.9 pounds.

The No. 2 electrode was stuck at the start of heat L65 and the arc was regulated by adjusting electrode No. 1.

HEAT L66.

The furnace was allowed to cool 2½ hours between heat L65 and heat L66, and both electrodes were stuck. They were forced out, and drops of zinc were found in the clearance between the refractory walls and the electrodes, but none between the graphite sleeves and the electrodes. Electrode No. 1, with the longer refractory wall, was soldered more tightly than No. 2. The holes and the electrodes were cleaned and the latter replaced. Into the warm furnace, without further preheating, was charged 21.3 pounds of zinc, then 30.5 pounds of brass ingot from run L65, then 40 pounds copper (¾ ingot, ¼ scrap). The arc was run 32 minutes, using 17½ kilowatt-hours. Rocking was begun early in the heat. The metal was poured at 1,070° C., 90 pounds being obtained. No leakage of zinc vapor occurred. Throughout this heat the electrodes were loose and moved freely.

The next morning both electrodes were stuck tight. As before, there was condensed zinc between the electrode and the refractory, but none between the electrode and the sleeve.

TESTS WITH ELECTRODES IN GRAPHITE SLEEVE AND IN GRANULAR CARBON PACKING.

The last three runs indicated that the graphite sleeve should extend entirely through the end wall and that the electrode should not bear against the refractory wall. Hence, one side of the furnace was provided with two 4-inch sleeves placed end to end, giving an 8-inch bearing of electrode against the graphite sleeve, and no bearing against the refractory wall. On the other end, an alundum ring about 1 inch thick was left on the inner wall of the furnace, and a pocket 4 inches in diameter was cut in the wall, giving a 1-inch opening all around the electrode. The alundum ring gave an appreciable clearance between the electrode and the refractory lining, but was too small to let the packing, 10-mesh granular carbon, fall through into the furnace. The granular packing was held in place by a 1-inch graphite slab fastened against the outside of the end wall, the electrode passing through a 2-inch hole in the slab. A hole for inserting the packing was cut in the slab. After the

electrode had been inserted, carbon packing was poured in and tamped down, until the packing completely filled the annular space, then the hole was closed with a graphite plug.

HEAT L67.

After the empty furnace was preheated, with a power consumption of 13 kilowatt-hours, 92.3 pounds of ingot brass—11.25 pounds from heat L59, 33.65 from heat L60, 47.40 from heat L62—was charged. Rocking was begun after 10 minutes. After 36 minutes, 17.25 kilowatt-hours being used, the metal was at $1,070^{\circ}\text{C}$.; 91.1 pounds was poured. After 25 minutes a little fume came out around the electrode with the granular packing, but none escaped around the one with the graphite sleeve.

Both electrodes were loose throughout the heat. The one with granular packing showed a slight tendency to bind, evidently due to packing of the granular carbon, but did not stick.

HEAT L68.

Into the hot furnace were charged 20.8 pounds zinc, 30.3 pounds ingot brass from heat L62, and 40 pounds of zinc (15 ingot, 25 scrap). The arc was on 22 minutes, and 13.75 kilowatt-hours was used. Rocking was started after 10 minutes. The metal was poured at $1,070^{\circ}\text{C}$.; 90.4 pounds was obtained. Both electrodes ran perfectly gas tight, without fuming, and were loose throughout the run.

The furnace was allowed to cool three hours. The electrodes were then a little tighter than at the end of the heat, but could both be moved without difficulty. After the first loosening, the electrode with the sleeve moved easier than the one with granular packing. The latter seemed to be slightly bound, apparently from jamming of the carbon granules and not from deposition of zinc.

HEAT L69.

In this heat, 20.6 pounds of zinc, 10.5 pounds of brass ingot from heat L64, 17.5 pounds of copper ingot, and 22.5 pounds of copper scrap were charged into the warm furnace, without preheating. The furnace was heated 42 minutes, 18.75 kilowatt-hours being used. Rocking was begun early in the heat. The metal was poured at $1,075^{\circ}\text{C}$.; 91.1 pounds was obtained.

HEAT L70.

In heat L70, 21.4 pounds of zinc, 30.9 pounds of brass ingot from heat L64, and 41 pounds of copper (half ingot, half scrap) were charged into the hot furnace. The arc was run 32 minutes, using 12.75 kilowatt-hours. Rocking started early in the heat. The metal was poured at $1,075^{\circ}\text{C}$.; 91.9 pounds was obtained.

HEAT L71.

The furnace was hot. Eleven pounds of zinc, 16.9 pounds of ingot brass from run L64, 38.5 pounds of ingot brass from run L66, and 20.2 pounds copper (half ingot, half scrap) were charged. The arc ran 32 minutes, using 13 kilowatt-hours. Rocking started early in the heat. The metal was poured at 1,080° C., 87.1 pounds being obtained.

GENERAL RESULTS OF HEATS L67 TO L71.

The electrodes did not stick during any of the five heats (Nos. L67 to L71), and were free the next morning. No zinc or zinc oxide was found on either electrode, on the graphite sleeve, or on the granular carbon packing. No fume escaped at the electrodes.

The electrode with the granular packing was very rough in spots from chipping off the zinc oxide accretion that formed when the electrode was run in contact with the refractory wall and without packing. This roughness probably accounts for the slight binding of that electrode when used with the granular packing. Either the graphite sleeve or the granular packing bids fair to eliminate sticking troubles. Of course, tests on the large-size furnace extending over a long period of time will be required to solve the problem fully. As far as can be told from the behavior of the laboratory furnace, it seems almost a certainty that no serious difficulty will be met in avoiding the sticking of electrodes by leading the electrode through either a graphite sleeve or a packing of granular graphite, coke, carborundum, or similar material.

The metal losses are shown in the table following:

Metal losses in 14 heats with the laboratory rocking furnace.

Heat No.	Charge.				Metal, poured, pounds.	Loss, pounds.	Apparent gain, pounds.	Loss, per cent.	Apparent gain, per cent.
	Brass, pounds.	Copper, pounds.	Zinc, pounds.	Total, pounds.					
L68.....	.....	90.7	.....	90.7	89.5	1.2	.....	1.35	.....
L69.....	.....	60.0	32.0	92.0	89.9	2.1	.....	2.33	.....
L60.....	48.5	30.0	16.5	95.0	95.2	.....	0.2	.....	0.21
L61.....	.....	90.0	.....	90.0	90.5	.....	0.5	.....	0.55
L62.....	29.6	40.0	21.6	91.2	89.7	1.5	.....	1.64	.....
L63.....	31.0	40.4	21.7	93.1	92.9	0.2	.....	0.22	.....
L64.....	83.3	.....	.....	83.3	80.9	2.4	.....	2.78	.....
L65.....	30.0	40.0	21.1	91.1	90.9	0.2	.....	0.22	.....
L66.....	30.5	40.0	21.3	91.8	90.0	1.8	.....	1.96	.....
L67.....	92.3	.....	.....	92.3	91.1	1.2	.....	1.30	.....
L68.....	30.3	40.0	20.8	91.1	90.4	0.7	.....	0.77	.....
L69.....	31.7	40.0	20.6	92.3	91.1	1.2	.....	1.30	.....
L70.....	30.9	41.0	21.4	92.3	91.9	0.4	.....	0.43	.....
L71.....	55.4	20.2	11.0	86.6	87.1	.....	0.5	.....	0.57
Total.....	1,272.8				1,261.1	.....	.....	.....	.....
Less 180.7 pounds copper (L58, L61).....	180.7				180.7	.....	.....	.....	.....
	1,092.1				1,080.4	11.5	.....	1.06	.....

Thus, the loss in melting 493.5 pounds of ingot 2:1 brass, 391.6 pounds of copper, and 208 pounds of zinc, or 45 per cent of previously alloyed material and 55 per cent of new metal, was less than 1.1 per cent.

The metal loss determined by weight may be due to mechanical loss of the alloy—that is, of both zinc and copper—or to volatilization of zinc during pouring, or to both. The analysis of the various lots of brass made are given below:

Results of analyses of brass.

Heat No.	No.	Composition as calculated on basis of no loss.		Actual composition.		Per cent less zinc in metal poured than in calculated charge.
		Copper content.	Zinc content.	Copper (by analysis).	Zinc (by difference).	
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	
L59.....	1	65.3	34.7	65.7	34.3	0.4
L60.....	2	65.3	34.7	65.4	34.6	.1
L62.....	3	65.2	34.8	65.7	34.3	.5
L63.....	4	65.3	34.7	65.7	34.3	.4
L64.....	5	66.1	33.9	66.5	33.5	.4
L65.....	6	65.3	34.7	65.2	34.8	a.1
L66.....	7	65.2	34.7	65.6	34.4	.3
L67.....	8	65.6	34.4	66.5	33.5	.9
L68.....	9	66.0	34.0	66.2	33.8	.2
L69.....	10	66.3	33.7	66.1	33.9	a.2
L70.....	11	66.6	33.4	66.8	33.2	.2
L71.....	12	65.5	34.5	65.5	34.5	.0

^aApparent gain.

The slight apparent gains in zinc content shown in the results of heats L65 and L69 may be due to the presence of nonmetallic materials in the scrap copper. The highest loss was on a heat (No. L67) where all previously alloyed ingot was remelted. The average loss by analysis, 0.4 per cent, means that a weighed out charge of 65 pounds of copper and 35 pounds of zinc yielded 65 pounds of copper and 34.3 pounds of zinc, or a calculated loss by weight of about 0.71 per cent, due to volatilization of zinc. The total loss, then, in this series of tests was about 0.4 per cent mechanical loss and 0.7 per cent volatilization loss.

POWER CONSUMPTION.

So far it has been shown that the large rocking furnace worked well, both, mechanically and metallurgically, on any alloy tried, as long as speltering was not involved, and tests in the laboratory furnace indicate that slight changes in the method of leading in the electrodes will make speltering possible, that lining, electrode, and labor costs are reasonable, and that metal losses are reduced. The remaining main factor is the power consumption.

The watt-hour meter was installed on the secondary side of the transformer at the furnace switchboard. Hence the transformer

losses and lead losses are not shown by this meter. In order to determine the magnitude of these losses a portable meter was put on the primary side, and the following readings of the power used for the arc were made by the Detroit-Edison meter department.

Comparison of power readings on primary and secondary circuits.

Heat No.	Secondary.	Primary.	Ratio (secondary: primary).
	<i>Kw.-hours.</i>	<i>Kw.-hours.</i>	
206.....	173	173	100:100
207.....	165	180	100:109
208.....	178	211	100:118
Total.....	516	564	= 100:109

= Average.

These determinations do not agree well, probably because the portable meter on the primary circuit is not readable to the same degree of accuracy as the one on the secondary. The average ratio shows that the power loss in the transformers and leads is about 10 per cent, which is rather higher than normal for such installations.

Mr. E. L. Crosby, of the Detroit Edison Co., says:

I would state the power factor and kilowatt-hour consumption in terms of the secondary readings, as that is the character of this load. The additional reactance and current losses of high-tension transformation should be looked upon exactly as they are in any other power business, as being incidental to securing a wholesale rate which would more than compensate for the increased investment in high-tension equipment and the losses involved. Power in the quantities involved by a 1,000 to 3,000 pound brass furnace might very well be sold at either primary or secondary rates, being dependent entirely on load factor. However, if two or more furnaces were used, the operation would be considerably cheaper at the primary rate.

That is, in Detroit one may either buy power at 4,600 volts, supplying his own transformer and paying for power metered on the high-tension side of the transformer, at a lower rate but for the total power consumed, or he may buy power at 130 volts, the power company furnishing the transformer, the power being metered on the low-tension side, and the consumer paying a higher rate for the lesser amount of power shown by the meter. Hence, in the results presented herein, the power figures will be given in terms of both secondary metering and primary metering, the latter being taken as 1.09 times the former.

Inasmuch as the true metallic content of the charges used, less the content of oil and dirt, is not accurately known, the power consumption has been figured on the gross charge. As small ingot, spillings, and metal poured into the "niggerhead," etc., were fed back into the furnace, usually without being weighed, during a run of several heats of the same composition, the actual amount of metal charged was often more than is given in the following pages.

The best basis for calculation is the power consumption, by primary metering, per unit of metal poured.

The power consumption will, of course, vary with the size of the charge and with the rate at which the furnace is used. If the furnace is run only a couple of heats a day, the power per ton of output will be much higher than if it is run 10 hours a day. If the furnace is run 24 hours a day, the power consumption per ton will be materially lower than on 10-hour operation.

Bulky charges, requiring a long time to charge, cut down the active running time, so that the power consumption will be higher on bulky charges than on compact charges, such as all ingot. Delays in pouring, such as waiting for the crane, also cut down power efficiency. The temperature to which the metal is heated greatly affects power consumption. If the furnace is run only a few hours a day, or only a few days a week, as in much of this test, the efficiency will be low compared with that on steady operation. That the large rocking furnace was not run on a steady basis was due to various factors. Often certain variables would be studied, and slight changes in the furnace or equipment made. Sometimes lack of material for melting would hold up both the coke-fired furnaces and the electric furnace. Again, in showing the Michigan Smelting and Refining Co. operator how to handle the furnace, no attempt was made at output. Throughout most of the test, experimental rather than regular operating conditions prevailed.

The power consumption is shown in Tables 6 and 7, in which are included all the days' runs that anywhere near approximated normal running for production. The periods of time given include any delays due to the furnace itself, and, unless noted under "Remarks," also include many incidental delays in waiting for the crane and ladle.

The power figures include any preheating of the empty furnace.

The averages represent what the furnace, as built, and working under the handicap of continual delays for crane and ladle, can do on the bulky, oily material used in the tests, week in and week out. Less oily or more compact charges, which would be met in the average foundry, would enable the furnace to give a larger output and a lower power consumption.

For alloys requiring higher pouring temperatures than those of the test, the output will be lower (assuming the same sort of charge as regards oiliness and bulkiness), but the power consumption will be higher; for alloys requiring lower pouring temperatures the reverse will apply.

TABLE 6.—Data on
CHARGE 632 POUNDS.

Date.	Heat No.	Alloy.				Character of charge.	Weight of charge.	Elapsed time, including charging, pouring, and all delays.	Power consumption, secondary.		
		Cu.	Sn.	Pb.	Zn.				Arc.	Motor.	Total secondary.
June 19.....	12	76	8	13	3	Compact.....	Pounds. 655	H. m. 2 12	Kw.-hrs. 198	Kw.-hrs. 4	Kw.-hrs. 202
Do.....	13	76	8	13	3	do.....	655	1 35	148	2	151
Do.....	14	76	8	13	3	do.....	655	1 06	99	2	101
Do.....	15	76	8	13	3	do.....	655	1 10	105	2	107
Do.....	16	76	8	13	3	do.....	655	1 17	115	2	117
Do.....	17	76	8	13	3	do.....	655	1 12	103	2	105
Do.....	18	76	8	13	3	do.....	655	1 03	93	2	95
Day total, 7 heats.							4,585	9 35	861	17	878
Aug. 3.....	116	67	1	2	30	Very bulky and oily.	600	1 30	133	2	135
Do.....	117	67	1	2	30	do.....	600	1 00	100	2	102
Do.....	118	67	1	2	30	do.....	600	1 20	87	2	89
Do.....	119	67	1	2	30	do.....	600	1 25	101	2	103
Do.....	120	67	1	2	30	do.....	600	1 10	132	2	134
Day total, 5 heats.							3,000	6 25	553	10	563
Aug. 4.....	121	67	1	2	30	Very bulky and oily.	600	1 15	123	2	125
Do.....	122	67	1	2	30	do.....	600	1 30	100	2	102
Do.....	123	67	1	2	30	do.....	600	1 05	90	2	92
Do.....	124	67	1	2	30	do.....	600	1 15	83	2	85
Do.....	125	67	1	2	30	do.....	600	1 10	85	1	86
Do.....	126	67	1	2	30	do.....	600	1 15	102	2	104
Do.....	127	67	1	2	30	do.....	600	1 00	93	2	95
Day total, 7 heats.							4,200	8 30	686	13	699
Oct. 26.....	167	68	1	7	24	Rather bulky	628	1 20	125	2	128
Do.....	168	68	1	7	24	do.....	628	1 30	136	2	139
Do.....	169	68	1	7	24	do.....	628	1 20	114	2	118
Do.....	170	68	1	7	24	do.....	628	1 15	96	1	97
Do.....	171	68	1	7	24	do.....	628	1 25	97	2	99
Do.....	172	68	1	7	24	do.....	628	1 10	100	1	101
Do.....	173	68	1	7	24	do.....	628	1 10	118	2	120
Day total, 7 heats.							4,396	9 10	786	14	802
4 day's total, 28 heats.							16,181	33 40	2,886	54	2,942
Average.....							622	(a) 131 (b) 257			

a Average time per heat.

b Average day.

power consumption.

APPROXIMATELY.

Pouring temperature.		Weight poured.	Power consumption, primary.	Secondary power consumption per 100 pounds of metal—		Primary power consumption per 100 pounds of metal—		Remarks.
*F.	*C.			Charged.	Poured.	Charged.	Poured.	
2,030	1,110	Pounds.	Kw.-hrs.	31	.....	.....	.....	Furnace not normally hot at start.
2,300	1,280	.....	.....	23	.....	.....	.....	
2,170	1,185	.....	.....	15.5	.....	.....	.....	
2,220	1,215	.....	.....	16.5	.....	.....	.....	
2,100	1,150	.....	.....	18	.....	.....	.....	Not including 40 minutes at noon hour.
2,220	1,215	.....	.....	16	.....	.....	.....	
2,180	1,185	.....	.....	14.5	.....	.....	.....	
2,180	1,185	4,449	956	19.2	19.8	21.0	21.5	
.....	.....	.....	.....	22.5	.....	.....	.....	Furnace not quite normally hot at start.
.....	.....	.....	.....	17	.....	.....	.....	Metal a little cold.
.....	.....	.....	.....	15	.....	.....	.....	Nearly 200 pounds of spill, drip, etc., charged in run 120, beside regular 600-pound charge.
.....	.....	.....	.....	17	.....	.....	.....	
.....	.....	.....	.....	22	.....	.....	.....	
1,970	1,075	2,811	614	18.8	20	20.5	22	
.....	.....	.....	.....	22.5	.....	.....	.....	
.....	.....	.....	.....	17	.....	.....	.....	
.....	.....	.....	.....	15.5	.....	.....	.....	
.....	.....	.....	.....	14	.....	.....	.....	
.....	.....	.....	.....	14	.....	.....	.....	
.....	.....	.....	.....	17.5	.....	.....	.....	Waited 20 minutes for ladle.
.....	.....	.....	.....	16	.....	.....	.....	
1,970	1,075	3,771	763	16.5	18.5	18.2	20.2	
.....	.....	.....	.....	20.5	.....	.....	.....	Furnace normal at start.
.....	.....	.....	.....	22	.....	.....	.....	Ladle cold, much skull added to next heat.
.....	.....	.....	.....	19	.....	.....	.....	
.....	.....	.....	.....	15.5	.....	.....	.....	
.....	.....	.....	.....	15.5	.....	.....	.....	
.....	.....	.....	.....	16	.....	.....	.....	
.....	.....	.....	.....	19	.....	.....	.....	75 pounds of spill, etc., extra, charged with this heat.
2,010	1,100	4,075	872	18.3	19.7	19.9	21.4	
2,020	1,105	15,106	3,205	18.3	19.5	20.0	21.3	
.....	.....	.....	.....	c 366	c 390	c 400	c 426	

c Per ton of material charged.

TABLE 6.—Data on power

CHARGE 1,300 POUNDS.

Date.	Heat No.	Alloy.				Character of charge.	Weight of charge.	Elapsed time, including charging, pouring, and all delays.	Power consumption secondary.		
		Cu.	Sn.	Pb.	Zn.				Arc.	Motor.	Total secondary.
							Pounds	H. m.	Kw.-hrs.	Kw.-hrs.	Kw.-hrs.
June 22.....	20	76	8	13	3	Compact.....	1,312	2 30	300	4	304
Do.....	21	76	8	13	3	do.....	1,312	1 55	194	4	198
Do.....	22	76	8	13	3	do.....	1,312	1 55	180	4	184
Do.....	23	76	8	13	3	do.....	1,312	1 30	175	3	178
Do.....	24	76	8	13	3	do.....	1,312	2 00	173	3	176
Day's total, 5 heats.							6,560	9 50	1,022	18	1,040
July 5.....	28	85	5	5	5	do.....	1,318	2 30	286	3	289
Do.....	29	85	5	5	5	do.....	1,295	2 00	197	1	198
Do.....	30	85	5	5	5	do.....	1,155	1 40	153	1	154
Do.....	31	85	5	5	5	do.....	1,298	1 30	169	1	170
Do.....	32	85	5	5	5	do.....	1,338	2 00	150	1	151
Day's total, 5 heats.							6,394	9 40	955	7	962
July 17.....	47	84	7	8	1	All borings.....	1,315	2 55	355	3	358
Do.....	48	84	7	8	1	do.....	1,310	2 55	263	3	256
Do.....	49	84	7	8	1	do.....	1,965	3 00	332	6	335
Day's total, 3 heats.							4,590	8 50	940	12	952
July 18.....	50	84	7	8	1	do.....	1,334	2 40	350	4	354
Do.....	51	84	7	8	1	do.....	1,200	1 45	228	3	231
Do.....	52	84	7	8	1	do.....	1,300	2 10	192	3	195
Do.....	53	84	7	8	1	do.....	1,300	2 00	178	2	180
Day's total, 4 heats.							5,134	8 35	948	12	960
Sept. 6.....	83	73	4	20	3	Compact.....	1,310	2 40	276	5	281
Do.....	84	73	4	20	3	do.....	1,310	2 05	201	4	205
Do.....	85	73	4	20	3	do.....	1,305	1 55	197	5	202
Do.....	86	73	4	20	3	do.....	1,306	2 00	191	3	194
Day's total, 4 heats.							5,432	8 40	865	17	882
Sept. 7.....	87	72½	6½	17½	3½	do.....	1,306	2 35	262	5	267
Do.....	88	72½	6½	17½	3½	do.....	1,306	2 05	225	4	229
Do.....	89	72½	6½	17½	3½	do.....	1,305	2 05	187	5	192
Do.....	90	72½	6½	17½	3½	do.....	1,308	1 50	161	4	165
Do.....	91	72½	6½	17½	3½	do.....	1,308	1 20	153	2	155
Day's total, 5 heats.							6,536	9 55	968	20	1,008
Sept. 11.....	94	76	8	13	3	do.....	1,306	2 50	284	6	290
Do.....	95	76	8	13	3	do.....	1,306	2 40	205	4	209
Do.....	96	76	8	13	3	do.....	1,305	2 10	185	5	190
Do.....	97	76	8	13	3	do.....	1,305	2 00	187	3	190
Do.....	98	76	8	13	3	do.....	1,306	1 40	191	3	194
Day's total, 5 heats.							6,530	11 20	1,052	21	1,073

consumption—Continued.

APPROXIMATELY.

Pouring temperature.		Weight poured.	Power consumption, primary.	Secondary power consumption per 100 pounds of metal—		Primary power consumption per 100 pounds of metal—		Remarks.
°F.	°C.			Charged.	Poured.	Charged.	Poured.	
2,150	1,175	Pounds.	Kw.-hrs.	23	.....	.....	.....	Furnace colder than normal at start.
2,150	1,175	.....	.....	15	.....	.....	.....	
2,140	1,165	.....	.....	14	.....	.....	.....	
2,160	1,180	.....	.....	13.5	.....	.....	.....	Time includes 35 minutes at noon.
2,100	1,150	.....	.....	13.5	.....	.....	.....	
2,140	1,170	6,347	1,134	15.8	16.4	17.3	17.9	
1,950	1,070	.....	.....	22	.....	.....	.....	Furnace colder than normal at start.
2,010	1,100	.....	.....	15.5	.....	.....	.....	
1,950	1,065	.....	.....	13.5	.....	.....	.....	
2,200	1,205	.....	.....	13.5	.....	.....	.....	
1,875	1,025	.....	.....	11.5	.....	.....	.....	
2,000	1,095	6,210	1,050	15.0	15.5	16.5	16.9	
2,100	1,160	.....	.....	27	.....	.....	.....	Furnace cool at start. Heat 47 includes 50 minutes (32 kw.-hours used) preheating.
2,125	1,160	.....	.....	19.5	.....	.....	.....	
2,150	1,175	.....	.....	17.3	.....	.....	.....	
2,125	1,160	4,416	1,039	20.7	21.5	22.6	23.5	
2,250	1,245	.....	.....	25.5	.....	.....	.....	
2,200	1,205	.....	.....	19	.....	.....	.....	
2,225	1,220	.....	.....	15	.....	.....	.....	
2,100	1,150	.....	.....	14	.....	.....	.....	
2,190	1,200	5,070	1,048	18.5	19.0	20.2	20.7	
.....	.....	.....	.....	21.5	.....	.....	.....	Furnace colder than normal at start. Heat 83 includes 20 minutes (35 kw.-hours used) preheating.
.....	.....	.....	.....	15.5	.....	.....	.....	
.....	.....	.....	.....	15.5	.....	.....	.....	
.....	.....	.....	.....	14.5	.....	.....	.....	
2,100	1,150	5,119	961	16.3	17.3	17.7	18.8	
.....	.....	.....	.....	20.5	.....	.....	.....	
.....	.....	.....	.....	17.5	.....	.....	.....	
.....	.....	.....	.....	14.5	.....	.....	.....	
.....	.....	.....	.....	12.5	.....	.....	.....	
.....	.....	.....	.....	12	.....	.....	.....	
2,125	1,160	6,410	1,099	15.5	15.7	16.9	17.2	
.....	.....	.....	.....	22	.....	.....	.....	Time excludes 30 minutes' wait for crane.
.....	.....	.....	.....	16	.....	.....	.....	
.....	.....	.....	.....	14.5	.....	.....	.....	
.....	.....	.....	.....	14.5	.....	.....	.....	Excludes 30 minutes' wait for crane.
.....	.....	.....	.....	14.5	.....	.....	.....	
2,125	1,160	6,478	1,182	16.5	16.6	18.1	18.3	

TABLE 6.—Data on pour-

CHARGE 1,300 POUNDS, AP

Date.	Heat No.	Alloy.				Character of charge.	Weight of charge.	Elapsed time, including charging, pouring, and all delays.	Power consumption secondary.		
		Cu.	Sn.	Pb.	Zn.				Arc.	Motor.	Total secondary.
Sept. 12.....	99	72½	6½	17½	3½	Average.....	Pounds. 1,306	H. m. 2 45	Kw.-hrs. 227	Kw.-hrs. 5	Kw.-hrs. 232
Do.....	100	72½	6½	17½	3½	do.....	1,306	2 00	211	5	216
Do.....	101	72½	6½	17½	3½	do.....	1,306	1 55	204	4	208
Do.....	102	72½	6½	17½	3½	do.....	1,306	1 35	193	4	197
Do.....	103	72½	6½	17½	3½	do.....	1,306	2 00	187	4	191
Day's total, 5 heats.							6,530	10 15	1,022	22	1,044
Sept. 13.....	104	72½	6½	17½	3½	Average.....	1,306	2 30	233	6	239
Do.....	105	72½	6½	17½	3½	do.....	1,306	2 15	207	3	210
Do.....	106	72½	6½	17½	3½	do.....	1,306	1 40	188	4	192
Do.....	107	72½	6½	17½	3½	do.....	1,306	1 15	178	3	181
Do.....	108	72½	6½	17½	3½	do.....	1,306	1 10	170	2	172
Day's total, 5 heats.							6,530	8 50	976	18	994
Oct. 10.....	132	84	4	4	8	Bulky.....	1,310	3 00	313	4	317
Do.....	133	84	4	4	8	do.....	1,310	2 00	216	4	220
Do.....	134	84	4	4	8	do.....	1,310	1 45	190	2	192
Do.....	135	84	4	4	8	do.....	1,310	1 55	181	3	184
Do.....	136	84	4	4	8	do.....	1,310	1 30	179	3	182
Day's total, 5 heats.							6,550	10 10	1,079	16	1,095
Oct. 11.....	137	84	4	4	8	Bulky.....	1,306	2 45	298	4	302
Do.....	138	84	4	4	8	do.....	1,306	1 50	201	3	203
Do.....	139	84	4	4	8	do.....	1,306	1 45	180	4	184
Do.....	140	84	4	4	8	do.....	1,306	1 50	178	3	181
Do.....	141	84	4	4	8	do.....	1,306	1 50	196	4	199
Day's total, 5 heats.							6,536	10 00	1,052	17	1,069
Oct. 18.....	153	78	2	10	10	Average.....	1,306	2 30	280	4	284
Do.....	154	78	2	10	10	do.....	1,306	2 00	216	3	219
Do.....	155	78	2	10	10	do.....	1,306	1 20	213	4	222
Day's total, 3 heats.							3,924	5 50	714	11	725
Oct. 25.....	163	84	6	10	0	Bulky.....	1,306	2 20	277	4	281
Do.....	164	84	6	10	0	do.....	1,306	2 15	218	4	222
Do.....	165	84	6	10	0	do.....	1,306	1 40	196	3	199
Do.....	166	84	6	10	0	do.....	1,306	1 35	199	3	202
Day's total, 4 heats.							5,224	7 50	800	14	804
Oct. 29.....	174	79	9	10	2	Average.....	1,310	3 25	378	4	382
Do.....	175	79	9	10	2	do.....	1,310	2 00	230	3	233
Do.....	176	79	9	10	2	do.....	1,310	2 00	214	4	218
Do.....	177	79	9	10	2	do.....	1,310	1 35	196	3	199
Day's total, 4 heats.							5,240	9 00	1,017	14	1,031

consumption—Continued.

PROXIMATELY—Continued.

Pouring temperature.		Weight poured.	Power consumption, primary.	Secondary power consumption per 100 pounds of metal—		Primary power consumption per 100 pounds of metal—		Remarks.
°F.	°C.			Charged.	Poured.	Charged.	Poured.	
		Pounds.	Kw.-hrs.					
				18				Time excludes 10 minutes' wait for ladle. Time excludes 15 minutes' wait for ladle. Do. Do.
				16.5				
				16				
				15				
				14.5				
2,125	1,160	6,316	1,189	16.0	16.5	17.5	18.0	
				18.5				
				16				
				14.5				
				14				
				13				
2,100	1,150	6,333	1,084	15.4	15.7	16.7	17.2	Furnace not fully hot at start.
				24				Heat 132 includes 50 minutes (75 kw.-hours used) preheating.
				17				
				14.5				
				14				
				14				
2,050	1,125	6,147	1,191	16.8	17.8	18.2	19.3	
				23				Heat 137 includes 40 minutes (70 kw.-hours used) preheating.
				15.5				
				14				About 100 pounds of spill added to this heat.
				14				
				15				
2,100	1,150	6,361	1,160	16.3	16.7	17.8	18.2	
				22				Furnace much cooler than usual at start.
				17				
				17				
2,100	1,150	3,766	791	18.4	19.4	20.2	21.0	
				21½				1½ hours' delay between heats 163 and 164, waiting for charge.
				17				
				15				
				15.5				
2,190	1,200	4,902	984	17.3	18.4	19.0	20.2	
				29				Furnace almost cold at start; was not run the prior two days. Heat 174 includes 1 hour 25 minutes (100 kw.-hours used) preheat. Excludes 15 minutes delay for crane.
				18				
				16.5				
				15				
2,100	1,150	5,166	1,128	20.1	20.4	21.5	22.2	

TABLE 6.—Data on power

CHARGE 1,300 POUNDS, AP

Date.	Heat No.	Alloy.				Character of charge.	Weight of charge.	Elapsed time, including charging, pouring, and all delays.	Power consumption, secondary.		
		Cu.	Sn.	Pb.	Zn.				Arc.	Motor.	Total secondary.
							Pounds.	H. m.	Kw.-hrs.	Kw.-hrs.	Kw.-hrs.
Oct. 30.....	178	79	9	10	2	Bulky.....	1,310	2 40	259	4	263
Do.....	179	79	9	10	2	do.....	1,310	2 05	230	4	234
Do.....	180	79	9	10	2	do.....	1,310	1 35	210	3	213
Do.....	181	79	9	10	2	do.....	1,310	1 50	189	3	192
Do.....	182	79	9	10	2	do.....	1,310	1 50	196	4	200
Day's total, 5 heats.							6,550	10 00	1,084	18	1,102
Oct. 31.....	183	67½	4	26½	2	Bulky.....	1,310	2 30	313	3	316
Do.....	184	67½	4	26½	2	do.....	1,310	2 05	218	3	221
Do.....	185	67½	4	26½	2	do.....	1,310	11 55	200	3	203
Do.....	186	67½	4	26½	2	do.....	1,310	1 50	189	3	192
Do.....	187	67½	4	26½	2	Compact.....	700	11 10	110	2	112
Day's total, 5 heats.							5,940	9 30	1,030	14	1,044
Nov. 1.....								2 00	151		151
Nov. 2.....	188	84	6	10	0	Average.....	1,304	2 55	299	5	304
Do.....	189	84	6	10	0	do.....	1,308	2 15	252	4	256
Do.....	190	85	5	5	5	Compact.....	1,892	2 10	260	4	264
Do.....	191	71½	1½	6	21	Bulky.....	1,314	1 50	183	4	187
Day's total, 4 heats.							5,818	9 10	994	17	1,011
Including Nov. 1, preheat.								11 10	1,045	17	1,162
Nov. 3.....	192	85	5	9	1	Average.....	1,314	3 40	267	4	261
Do.....	193	85	5	9	1	do.....	1,314	1 50	219	3	223
Do.....	194	79	9	10	2	} Little bulkier than average.	1,304	1 35	196	3	196
Do.....	195	79	9	10	2		1,304	1 30	190	2	192
Do.....	196	79	9	10	2		1,304	1 40	190	3	193
Do.....	196	79	9	10	2		1,304	1 40	190	3	193
Day's total, 5 heats.							6,540	10 15	1,083	14	1,086
Nov. 4.....	197	79	9	10	2	} Little bulkier than average.	1,304	1 45	225	3	228
Do.....	198	79	9	10	2		1,304	1 30	199	3	202
Do.....	199	79	9	10	2		1,304	1 40	196	2	198
Do.....	200	79	9	10	2		1,304	1 40	178	2	178
Do.....	201	79	9	10	2		1,304	1 30	162	2	164
Do.....	202	79	9	10	2		1,304	1 45	190	2	192
Day's total, 6 heats.							7,824	9 50	1,118	14	1,132

consumption—Continued.

PROXIMATELY—Continued.

Pouring temperature.		Weight poured.	Power consumption, primary.	Secondary power consumption per 100 pounds of metal—		Primary power consumption per 100 pounds of metal—		Remarks.
°F.	°C.			Charged.	Poured.	Charged.	Poured.	
		Pounds.	Kw.-hrs.	20 18 16.5 14.5 15				Excludes 15 minutes' wait for crane. Do. Includes 15 minutes (11 kw.-hours used) in draining furnace for change of alloy.
2,060	1,125	6,349	1,201	16.8	17.4	18.4	18.9	
				24 17 15.5 14.5 16				Includes 30 minutes and (53 kw.-hours used) preheating.
2,180	1,175	5,850	1,138	17.6	17.9	19.2	19.5	
			165					Foundry not running; empty furnace, heated.
				23 19.5 14 14				Furnace cooler than usual at start.
2,190	1,200	5,604	1,102	17.4	18.1	19.0	19.6	
			1,267	20.0	20.7	21.8	22.6	
2,000	1,095			20				Furnace cooler than usual, not run previous 2 days. Heat 192 includes 1 hour and 20 minutes (100 kw.-hours used) preheating.
2,060	1,120			17				
2,125	1,165			15				
2,200	1,205			14.5				
2,200	1,205			15				Time includes 20 minutes for charging heat 197.
2,115	1,155	6,360	1,162	16.3	16.8	17.8	18.3	
2,125	1,165			18.5				
2,175	1,190			15.5				
2,260	1,230			14.5				
2,240	1,225			13.5				
2,100	1,150			12.5				
2,125	1,165			12.5				Time includes 20 minutes for charging heat 203.
2,185	1,195	7,571	1,236	14.7	15.0	15.8	16.3	

TABLE 6.—Data on power

CHARGE 1,300 POUNDS, AP

Date.	Heat No.	Alloy.				Character of charge.	Weight of charge.	Elapsed time, including charging, pouring, and all delays.	Power consumption, secondary.		
		Cu.	Sn.	Pb.	Zn.				Arc.	Motor.	Total secondary.
Nov. 7.....	203	79	9	10	2	Little bulkier than average.	Pounds. 1,304	K. w. 1 35	Kw.-hrs. 215	Kw.-hrs. 3	Kw.-hrs. 218
Do.....	204	79	9	10	2		1,304	1 40	195	2	197
Do.....	205	79	9	10	2		1,304	1 30	180	2	182
Do.....	206	79	9	10	2		1,304	1 35	173	2	175
Do.....	207	84	6	10	0		1,304	1 40	165	2	167
Do.....	208	87½	5	10	7	Very bulky..	1,304	2 30	178	3	181
Day's total, 6 heats.							7,824	10 30	1,106	14	1,120
Nov. 8.....	209	84	6	10	0	Very bulky..	1,300	3 00	246	2	248
Do.....	210	84	6	10	0	do.....	1,300	1 40	198	3	201
Do.....	211	84	6	10	0	do.....	1,300	2 05	188	2	190
Do.....	212	84	6	10	0	do.....	1,300	1 30	169	3	172
Do.....	213	84	6	10	0	do.....	1,300	1 50	170	1	171
Day's total, 5 heats.							6,500	10 05	971	11	982
Nov. 9.....	214	84	6	10	0	Very bulky..	1,300	1 45	223	4	227
Do.....	215	84	6	10	0	do.....	1,300	2 05	198	3	201
Do.....	216	84	6	10	0	do.....	1,300	1 50	195	2	197
Do.....	217	84	6	10	0	do.....	1,300	1 45	189	3	192
Do.....	218	84	6	10	0	do.....	1,300	1 26	165	2	167
Day's total, 5 heats.							6,500	8 50	970	14	984

consumption—Continued.

PROXIMATELY—Continued.

Pouring temperature.		Weight poured.	Power consumption, primary.	Secondary power consumption per 100 pounds of metal—		Primary power consumption per 100 pounds of metal—		Remarks.
°F.	°C.			Charged.	Poured.	Charged.	Poured.	
2,125	1,165	Pounds.	Kw.-hrs.	17				Includes 50 minutes' delay from electrode breaking in charging bulky charge, also 20 minutes charging heat 209.
2,165	1,185	.....	.....	15				
2,175	1,190	.....	.....	14				
2,140	1,170	.....	.....	13.5				
2,150	1,175	.....	.....	13				
1,950	1,065	.....	.....	14				
2,120	1,160	7,563	1,210	14.4	14.8	15.5	16.0	
2,050	1,120			19				Time includes 1 hour and 10 minutes' delay from electrode breaking, owing to bulky charge; long delay due to filling down over-size nipple.
2,175	1,190	.....	.....	15.5				
2,175	1,190			14.5				Includes 25 minutes for adjusting electrode holder.
2,175	1,190	.....	.....	13.5				
2,175	1,190			13				Includes 20 minutes for charging heat 214.
2,150	1,175	6,341	1,069	15.1	15.5	16.5	16.9	
2,175	1,190	.....	.....	17.5				
2,200	1,205	.....	.....	15.5				
2,160	1,180	.....	.....	15				
2,260	1,235	.....	.....	14.5				
2,150	1,175			13				
2,190	1,200	6,407	1,073	15.2	15.4	16.5	16.7	

TABLE 7.—Summary of power consumption.

Date.	Number heats.	Quantity of material charged.	Time elapsed.	Power consumption, secondary circuit.			Pouring temperature.	Weight poured.	Power consumption, primary circuit.
				Arc.	Motor.	Total secondary.			
		Pounds.	Hrs. min.	Kw.-hrs.	Kw.-hrs.	Kw.-hrs.	°C.	Pounds.	Kw.-hrs.
June 22.....	5	6,560	9.50	1,022	18	1,040	1,170	6,347	1,134
July 5.....	5	6,394	9.40	955	7	962	1,095	6,210	1,050
July 17.....	3	4,590	8.50	940	12	952	1,160	4,418	1,039
July 18.....	4	5,184	8.35	948	12	960	1,200	5,070	1,043
Sept. 6.....	4	5,432	8.40	865	17	882	1,150	5,119	961
Sept. 7.....	5	6,536	9.55	988	20	1,008	1,160	6,410	1,090
Sept. 11.....	5	6,536	11.20	1,052	21	1,073	1,160	6,478	1,182
Sept. 12.....	5	6,530	10.15	1,022	22	1,044	1,160	6,315	1,129
Sept. 13.....	5	6,530	8.50	976	18	994	1,150	6,332	1,064
Oct. 10.....	5	6,550	10.10	1,079	16	1,095	1,125	6,147	1,191
Oct. 11.....	5	6,530	10.00	1,052	17	1,069	1,150	6,361	1,166
Oct. 18.....	3	3,924	5.50	714	11	725	1,150	3,766	791
Oct. 25.....	4	5,224	7.50	890	13	903	1,200	4,902	984
Oct. 29.....	4	5,210	9.00	1,017	14	1,031	1,150	5,166	1,128
Oct. 30.....	5	6,550	10.00	1,084	18	1,102	1,125	6,249	1,201
Oct. 31.....	5	5,940	9.30	1,030	14	1,044	1,175	5,850	1,138
Nov. 1 and 2.....	4	5,818	11.10	1,045	17	1,162	1,200	5,604	1,267
Nov. 5.....	5	6,540	10.15	1,052	14	1,066	1,155	6,380	1,162
Nov. 6.....	6	7,824	9.50	1,118	14	1,132	1,195	7,571	1,236
Nov. 7.....	6	7,824	10.30	1,106	14	1,120	1,160	7,583	1,210
Nov. 8.....	5	6,500	10.05	971	11	982	1,175	6,341	1,069
Nov. 9.....	5	6,500	8.50	970	14	984	1,200	6,407	1,073
Total 22 days....	103	135,256	198.55	21,896	334	22,330	a 1,160	131,105	24,346
Last 5 days.....	27	85,188	41.30	5,217	67	5,284	b 1,175	34,262	5,750

a 2,125° F.

b 2,150° F.

NOTE.—In the last 5 days (November 5–9) the arc was on 32 hours, 17½ hours being spent in charging and pouring, that is, the average power demand while the arc was running was 163 kilowatts at 85 per cent average power factor on secondary side; average demand is 192 kilovolt amperes. Voltage averaged 131 on open circuit, 116 under load, that is, the average current on secondary side is 1,650 amperes. With an average power factor of 77 per cent on the primary side, the average demand on the primary is 211 kilovolt amperes, thus one 200 kilowatt (rated capacity) transformer is sufficient.

Average power consumption, entire 22 days and last 5 days.

	Entire 22 days.	Last 5 days of run.
Average charge, pounds.....	1,313	1,304
Average time for days run, hours and minutes.....	9 . 03	9 . 54
Average time per heat, hours and minutes.....	1 . 56	1 . 50
Total gross metal loss including oil and dirt:		
Pounds.....	4,151	926
Average per cent.....	3.07	2.65
Average output, pounds of metal poured per hour.....	657	692
Average power consumption per 100 pounds of material charged, kw.-hours:		
Secondary circuit.....	16.50	15.05
Primary circuit.....	17.90	16.35
Average power consumption per 100 pounds of metal poured, kw.-hours:		
Secondary circuit.....	17.0	15.4
Primary circuit.....	18.5	16.8
Average power consumption per ton of material charged, kw.-hours:		
Secondary circuit.....	330	301
Primary circuit.....	358	327
Average power consumption per ton of metal poured, kw.-hours:		
Secondary circuit.....	340	308
Primary circuit.....	370	336

EFFECT OF SIZE OF CHARGES.

On 622-pound charges heated to $1,105^{\circ}\text{C}$., average, the power consumption measured on the primary side, was 400 kilowatt-hours per ton of material charged, but this figure is high because it is based on an $8\frac{1}{2}$ -hour day. On 1,304-pound charges, heated to $1,160^{\circ}\text{C}$. the average power consumption was 358 kilowatt-hours per ton for the period represented by the last 22 days and 327 for that represented by the last five days.

As only two heats, Nos. 49 and 190, were made on 1,950-pound charges, there are not enough data to tell the power consumption on large heats. There should be a slight improvement over the figures for 1,300-pound charges on increasing the charge to 1,500 pounds, which the furnace is capable of handling readily.

It should be noted that the rocking type of furnace promises to show good efficiency, not only in the larger sizes but in the smaller ones as well.

In the last series of tests, the laboratory furnace when lined in such a way as to have only about 90-pound capacity, gave the following results on yellow brass, pouring temperature $1,075^{\circ}\text{C}$.

Results in melting 2:1 yellow brass, poured at $1,075^{\circ}\text{C}$, in laboratory furnace.

Heat.	Charge, pounds.	Power consumption, measured on secondary.		Pouring temperature, $^{\circ}\text{C}$.	Condition of furnace.
		Total kilowatt-hours.	Kilowatt-hours per 100 pounds.		
L67.....	92.3	30.25	33	1,070	Cold.
L68.....	91.1	12.75	15	1,070	Hot.
L69.....	92.3	12.75	20	1,075	Cool after cooling 3 hours.
L70.....	92.3	12.75	14	1,075	Hot.
L71.....	86.6	12	15	1,080	Do.
Total or average.	454.6	88.5	{ 19.5 = 395 }	.....	

• Average kilowatt-hours per ton.

When lined for about 125-pound capacity, the furnace gave the following results on red brass, poured at 1,200° C.

Results in melting red brass, poured at 1,200° C, in laboratory furnace.

Heat.	Charge, pounds.	Power consumption, measured on secondary.		Pouring temperature, ° C.	Condition of furnace.
		Total kilowatt-hours.	Kilowatt-hours per 100 pounds.		
L34.....	127.3	39	31	1,140	Cold.
L35.....	127.7	30.5	25	1,180	Hot.
L36.....	128.5	26.5	20	1,220	Do.
L37.....	126.5	22.5	18	1,220	Do.
L38.....	129.5	19	15	1,200	Do.
Total or average.	639.5	137.5	{ 21.5 = 430 }	.....	

It would seem that a rocking furnace of, say, 500-pound capacity might be useful for foundries whose output is too small to permit the economical use of one of larger size.

CALCULATED EFFECT OF 24-HOUR OPERATION.

As in 24-hour operation the furnace would always be fully hot, the power consumption on that basis would be not higher, and would probably be less, than the figures for the last two heats of the day when running on a 10-hour schedule.

This is seen to be, for melting red brass in a furnace of 1,500-pound capacity, about 330 (primary) kilowatt-hours per ton poured for 625-pound charges and 290 for 1,310-pound charges, or on the best figures, would be 275 per ton for the latter charge.

FURTHER TESTS MADE IN 1918.

After the conclusion, in November, 1917, of the tests conducted by the Bureau of Mines at Detroit, the furnace lay idle till the beginning of April, 1918. Although a member of the Michigan Smelting & Refining Co.'s staff had been trained in handling the furnace, no observations were made and no data were recorded by that firm on the operation of the furnace during the 1917 test, as no member of the technical staff could be spared from his other work.

In March, 1918, Mr. C. T. Bragg, who had become works manager of the Michigan Smelting & Refining Co., decided to make additional tests of the furnace, with a view to the installation of other furnaces of this type if the test proved satisfactory.

As 24-hour operation was to be tried and a few runs made on speltered extrusion metal, the Bureau of Mines took the opportunity of obtaining additional data on these points, which had not been

thoroughly covered by the previous test, and sent a representative to Detroit to cooperate in the test.

The metal-loss records for heats 219 to 221, made with 220 volts, when the arc was uncontrollable, had shown that as a result of the excessive power drawn by the arc at that voltage the roof had failed and permitted molten metal to penetrate the lining. However, the lining seemed to be in fair shape, and the company decided to try a few heats without relining. The metal losses continued slightly higher than normal, even with an all-ingot charge, and finally, in heat 230, the roof failed visibly.

The roof part and the end walls were relined. Only the inner corundite lining required replacement, as the heat-insulating bricks were in good condition; 207 pounds of metal was removed from behind the brick. The original lining of the hearth proper seemed good for indefinite service and was left in. Close-fitting graphite sleeves were placed about the electrodes in the manner indicated in the description of the laboratory experiments. Sixty-two man-hours were required in repairing the lining.

The furnace was then run intermittently for a few days.

Table 8 shows the results obtained from running the furnace a few hours daily—that is, at much less than its capacity.

TABLE 8.—Data on 1918 tests, 10-hour operation or less.

Melting alloy consisting of 75% per cent Cu, 7½% per cent Sn, 14¼ per cent Pb, and 3 per cent Zn.]

Data.	Consecutive heat No.	Day heat No.	Weight of charge.	Elapsed time.	Melting time.	Power used for arc and rocking motor.		Weight of ingots poured.	Power consumption (primary) per ton of metal poured.	Remarks.
						Secondary.	Equivalent primary.			
			<i>Pounds.</i>	<i>Hr. min.</i>	<i>Hr. min.</i>	<i>Kw.-hrs.</i>	<i>Kw.-hrs.</i>	<i>Pounds.</i>	<i>Kw.-hrs.</i>	
Apr. 22.....	235	1	1,300	3 45	2	373				Furnace practically cold at start. Time includes 1 hour 5 minutes for preheating; 100 kilowatt-hours put in.
Do.....	236	2	1,300	1 40	1 25	212				Pot of metal from coke fire spilled near switchboard, damaging meters and causing shutdown for balance of day.
Day's total.....			2,600	5 25	3 25	585	633	2,596	490	
Apr. 23.....	237	1	1,300	3 20	2 45	318				Furnace quite cold at start. Time includes 55 minutes for preheating; 75 kilowatt-hours used.
Do.....	238	2	1,300	1 55	1 20	202				
Do.....	239	3	1,300	1 47	1 8	175				
Do.....	240	4	1,300	1 42	1 6	164				
Do.....	241	5	1,300	1 34	1 4	159				
Day's total.....			6,500	10 18	7 23	1,018	1,112	6,337	392	
Apr. 24.....	242	1	1,300	2 12	1 40	233				
Do.....	243	2	1,300	2	1 32	194				
Do.....	244	3	1,300	1 50	1 18	175				
Do.....	245	4	1,300	1 30	1 57	157				
Do.....	246	5	1,300	1 40	1 4	153				Time includes 8 minutes' delay for changing broken electrode nipple.
Day's total.....			6,500	9 12	6 31	912	999	6,247	320	Faulty connection in small booster transformer; furnace was (die 4 hours between heats 243 and 246) for replacing transformer. Smaller transformer put in. Open-circuit voltage, 120 volts on heat 249 and thereafter.
Apr. 25.....	247	1	1,300	1 55	1 43	220				
Do.....	248	2	1,300	1 53	1 25	190				

Do.....	249	3	1,300	1 53	1 35	207	.....	.....	.....	.....
Day's total.....			3,900	5 43	4 43	625	631	3,894	350	
Apr. 26.....	250	1	1,300	2 35	9 5	255	.....	.....	.....	
Do.....	251	2	1,300	2 13	1 43	204	.....	.....	.....	
Do.....	252	3	1,300	1 57	1 18	177	.....	.....	.....	
Day's total.....			3,900	6 45	5 6	636	694	3,790	359	
Apr. 27.....	253	1	1,300	2 37	2	225	.....	.....	.....	
Do.....	254	2	1,300	2 1	1 21	185	.....	.....	.....	
Do.....	255	3	1,300	1 27	1 10	166	.....	.....	.....	
Day's total.....			3,900	5 55	4 31	577	630	3,946	323	
Apr. 28.....	256	1	1,305	3 40	2 13	357	.....	.....	.....	
Do.....	257	2	1,305	2 4	1 30	213	.....	.....	.....	
Do.....	258	3	1,305	1 41	1 13	190	.....	.....	.....	
Do.....	259	4	1,305	1 40	1 10	165	.....	.....	.....	
Do.....	260	5	1,305	2 5	1 17	155	.....	.....	.....	
Day's total.....			6,525	11 10	7 23	1,070	1,168	6,422	364	
Total.....			33,825	54 28	39 2	5,423	5,922	33,121	357	

Furnace idle 1 hour 30 minutes between heats 250 and 251 for replacing broken electrode and altering cooling coil.

Time includes 1 hour for preheating; 124 kilowatt-hours used.

Saturday, foundry did not run during afternoon.

Furnace cool from standing over Sunday. Time includes 1 hour 15 minutes for preheating; 100 kilowatt-hours put in.

Each charge in the heats given in Table 8 consists of 600 pounds of ingot, 200 of red borings (1 per cent oil), 50 of yellow fixtures, 344 of copper, and 106 of lead; total, 1,300 pounds.

The 33,825 pounds charged contained 52 pounds of oil, leaving 33,773 pounds of metallic material charged. From this, 33,121 pounds of good ingot was obtained; thus, the gross loss was 706 pounds, or 2.09 per cent, including oil. Nineteen pounds of scrap, which was not charged back, and 452 pounds of skimmings, containing 238 pounds of recoverable metallic material, was obtained, leaving a net metallic loss of 397 pounds, or 1.14 per cent. No account was taken of the recoverable metal in ladle skulls.

ACTUAL 24-HOUR OPERATION.

The results of a 4-day test in which the furnace was run approximately 24 hours daily are shown in Table 9. The power consumption was lower than had been calculated on the basis of the last heats of the day in 10-hour operation.

TABLE 9.—Data for 1918 test, approximately 24-hour operation.

Date.	Consecutive heat No.	Day of heat No.	Weight of charge.	Composition of alloy.	Elapsed time.	Melting time.	Power used for arc and for rocking motor.		Power consumption (primary meter) per ton charged.	Remarks.
							Second-ary.	Equi-valent primary.		
April 30.....	261	1	Pounds. 1,305	Copper, 75½; tin, 4½; lead, 14½; and zinc, 3 per cent.	H. m. 2 9	H. m. 1 47	Kw.-hrs. 229	Kw.-hrs.	Kw.-hrs.	Furnace idle since 4.30 p. m. of Apr. 20. Charge for heat 261 put in furnace previous afternoon; heat started at 6.23 a. m.
Do.....	262	2	1,305	do.....	1 53	1 28	192			
Do.....	263	3	1,305	do.....	1 55	1 22	186			
Do.....	264	4	1,305	do.....	1 44	1 13	185			
Do.....	265	5	1,305	do.....	1 44	1 15	144			
Do.....	266	6	1,305	do.....	2 12	1 2	141			
Do.....	267	7	1,305	do.....	1 30	55	153			
Do.....	268	8	1,305	do.....	1 35	58	156			
Do.....	269	9	1,305	do.....	1 11	0	151			
Do.....	270	10	1,305	do.....	1 33	1 2	146			
May 1.....	271	11	1,305	do.....	1 33	1 59	143			
Do.....	272	12	1,305	do.....	1 47	1 6	149			
Do.....	273	13	1,305	do.....	2 1	1 2	150			
24 hours' total.....			16,965		23 17	15 11	2,074	2,260	a 266	
May 1.....	274	1	1,305	Copper, 75½; tin, 4½; lead, 14½; and zinc, 3 per cent.	2 11	1 18	143			
Do.....	275	2	1,305	do.....	1 49	1 12	147			
Do.....	276	3	1,305	do.....	1 40	1 7	152			
Do.....	277	4	1,305	do.....	1 33	1 55	142			
Do.....	278	5	1,305	do.....	1 43	1 12	142			
Do.....	279	6	1,305	do.....	3 ..	1 20	160			
Do.....	280	7	1,305	do.....	1 32	1 2	151			
Do.....	281	8	1,305	do.....	1 21	57	146			
Do.....	282	9	1,305	do.....	1 16	53	145			
Do.....	283	10	1,305	do.....	1 23	55	151			
May 2.....	284	11	1,305	do.....	1 31	56	152			
Do.....	285	12	1,305	do.....	1 34	1 1	152			

Time includes 36 minutes' wait for helpers at pouring time.

Time includes 1 hour 10 minutes for replacing broken electrode and altering cooling coil.

TABLE 9.—Data for 1918 test, approximately 24-hour operation—Continued.

Date.	Consecutive heat No.	Day heat No.	Weight of charge.	Composition of alloy.	Elapsed time.	Melting time.	Power used for arc and for rocking motor.		Power consumption (primary meter) per ton charged.	Remarks.
							Second-ary.	Equiva-lent primary.		
May 2.....	286	13	Pounds. 1,305	Copper, 75; tin, 4; lead, 14; and zinc, 3 per cent.	H. m. 1 20	H. m. 48	Kw.-hrs. 141	Kw.-hrs. 141	Kw.-hrs.	
Do.....	287	14	1,305	do.....	1 35	53	147			
24 hours' total.....			18,270		23 35	14 20	2,076	2,262	2,262	
May 2.....	288	1	1,305	Copper, 75; tin, 4; lead, 14; and zinc, 3 per cent.	1 35	5	150			Furnace idle 45 minutes between shifts.
Do.....	289	2	1,305	do.....	1 25	52	145			
Do.....	290	3	1,305	do.....	1 25	57	143			
Do.....	291	4	1,305	do.....	1 20	55	144			
Do.....	292	5	1,305	do.....	1 35	1 2	144			
Do.....	293	6	1,305	do.....	1 30	56	141			Long delay resulted in pouring this heat.
Do.....	294	7	1,300	Copper, 84; tin, 6; and lead, 10 per cent.	1 31	4	140			
Do.....	295	8	1,300	do.....	1 18	50	150			
Do.....	296	9	1,300	do.....	1 44	59	158			
Do.....	297	10	1,300	do.....	1 22	52	151			
Do.....	298	11	1,300	do.....	2 13	1 5	156			
May 3.....	299	12	1,300	do.....	1 28	59	162			
Do.....	300	13	1,300	do.....	1 37	1 10	179			
Do.....	301	14	1,300	do.....	1 49	1 12	163			Time includes 39 minutes' delay for repairing broken electrode.
24 hours' total.....			18,230		22 5	13 58	2,126	2,317	2,317	
May 3.....	302	1	1,300	Copper, 84; tin, 6; and lead, 10 per cent.	1 43	1 14	167			Furnace idle 1 hour 20 minutes between shifts.
Do.....	303	2	1,300	do.....	1 43	1 22	158			Furnace idle 1 hour between heats 303 and 304.
Do.....	304	3	1,300	do.....	1 55	1 9	155			
Do.....	305	4	1,300	do.....	1 44	1 17	159			Furnace idle 25 minutes between heats 304 and 305 for patching electrode hole.
Do.....	306	5	1,300	do.....	1 50	1 16	166			
Do.....	307	6	1,300	do.....	1 36	1 10	162			

Do.....	308	7	1,300	do.....	1	23	1	10	162	Time includes 42 minutes for changing two electrodes broken in charging.
Do.....	309	8	1,300	do.....	2	15	1	5	165	
May 4.....	310	9	1,305	Copper, 74; tin, 4; lead, 14; and time, 3 per cent.	1	19		55	152	End of heat, 6.35 a. m.
Do.....	311	10	1,305	do.....	1	14	1	0	140	
Do.....	312	11	1,305	do.....	1	21	1	50	142	
Do.....	313	12	1,305	do.....	1	36	1	13	144	
24 hours' total.....			15,620		19	35	13	41	1,875	
4 days' total, 53 heat.			69,085		88	35	57	19	8,151	
									2,044	a 262
									8,883	a 258

a Average.

Total quantity of good ingot poured, 67,568 pounds; average power consumption (primary) per ton of good ingot poured, 264 kilowatt-hours; average output, 764 pounds per hour; output in heats 274 to 301, 815 pounds per hour; average elapsed time per heat, 1 hour 40 minutes; average melting time, 1 hour 5 minutes; average time for charging, pouring, and delays, 35 minutes; 20 minutes of this is delay not due to the furnace.

The charges for heats 256 to 293 and 310 to 313, with an alloy containing 75½ per cent copper, 7½ per cent tin, 14½ per cent lead, and 3 per cent zinc comprised 25,200 pounds of ingot; 11,220 of red borings (2 per cent oil); 1,400 of yellow borings (3 per cent oil); 1,540 of medium brass; 10,987 of cabbaged, tinned copper wire; 552 of ingot copper; and 3,906 of lead; total, 54,805 pounds.

The charges for heats 294 to 309, with an alloy containing 84 per cent copper, 6 per cent tin, and 10 per cent lead comprised 16,000 pounds of ingot, 4,704 of copper, and 96 of lead; total, 20,800 pounds.

METAL LOSSES IN THE 24-HOUR TESTS.

In heats 261 to 293 and 310 to 313, with the alloy containing 75½ per cent copper, 7½ per cent tin, 14½ per cent lead, and 3 per cent zinc, 48,305 pounds was charged, of which 305 pounds was oil, leaving 47,980 pounds of metallic material. From this 47,419 pounds of good ingot was poured, giving a gross loss of 886 pounds, or 1.83 per cent. Fifty-eight pounds of scrap metal was obtained and was not fed back, also 257 pounds of metallic material was obtained from 484 pounds of skimmings (assay by Michigan Smelting & Refining Co.'s chemist showed 53 per cent metallic material); hence, a total of 315 pounds of secondary metal was recovered.

Of the gross loss of 886 pounds, 305 pounds was oil and 315 was recovered as scrap or from skimmings, leaving 286 pounds of net metallic loss from 47,980 pounds metallic material charged; hence the net metal loss was 0.60 per cent.

In heats 294 to 309, with the 84 per cent copper, 6 per cent tin, 10 per cent lead alloy, 20,800 pounds was charged and 20,149 of good ingot was poured, giving a gross loss of 651 pounds, or 3.13 per cent. There were 43 pounds scrap not fed back, 130 pounds of recoverable metallic material in 246 pounds of skimmings, and 365 in 429 of ladle skulls; thus, the total recovery of secondary metal was 530 pounds, or 2.59 per cent, and the actual net loss was 113 pounds, or 0.54 per cent.

ELECTRODE CONSUMPTION.

The electrode consumption, including all waste from breakage, was less than 2 pounds per ton of metal melted in the four-day test of 24-hour operation.

FURTHER TESTS ON EXTRUSION METAL.

After the 24-hour tests were concluded, two heats were made with yellow borings alone and eight with extrusion metal containing 60 per cent copper, 37 per cent zinc, and 3 per cent lead, spelter being added in the latter, in order to study the sticking of the electrodes.

No attempt was made to get maximum production or minimum power consumption, nor to determine metal losses.

Before heat 235 was started close-fitting graphite sleeves had been placed about the electrodes. This arrangement was found to be helpful even in melting red brass, as the electrodes always worked smoothly in the sleeves and without friction, which had sometimes given trouble when the electrodes passed directly through the refractory wall.

The electrodes tended to stick slightly during the four preliminary heats, until experience had shown how hot the electrodes should be permitted to run. The zinc that condenses in the clearance space between the electrode and the sleeve should be kept molten by using no cooling water in the electrode cooling coils until the latter part of the first heat in the morning and none between heats when the arc is off for pouring and charging.

On May 7, 1918, a run (No. 318) was made with a 600-pound charge, comprising 100 pounds of billet ends, 340 of oily yellow borings (very light and bulky), 61 of copper, and 75 of zinc. The empty, nearly cold furnace was preheated with 92 kilowatt-hours; it then stood 3 hours, when all the material was charged, except the zinc, which was added at the end of the heat.

The furnace ran smoothly but took 155 kilowatt-hours for the arc, because of the previous three hours' cooling, and 4 for the motor.

In the next heat, No. 319, the charge was of the same weight and composition and was also splattered at the end of the run. In this heat 103 kilowatt-hours was used by the arc and 2 kilowatt-hours by the motor.

In heat 320 a 1,200-pound charge of the same composition was used and was splattered at the end, as in the two previous heats; 153 kilowatt-hours was used by the arc and 3 by the motor. After this heat the electrodes were removed and a few drops of zinc were found in the sleeves. No zinc oxide was found. The electrodes and sleeves were cleaned and the electrodes were replaced. The billets poured from this heat analyzed 60.46 per cent copper.

The charge for heat 321, which was to be run the next morning, consisted of 1,200 pounds of the same material as before. The 150 pounds of metallic zinc was charged in the bottom of the hot furnace and covered with the borings, on top of which were charged the billet ends and the copper. Then the door was replaced, and a vent left for the oil vapors and gas to escape, in which condition the furnace and charge was left over night. Next morning the arc was run two hours, using 224 kilowatt-hours; the rocking motor took 5 kilowatt-hours. The metal was very hot. The billets poured analyzed 59.84 per cent copper.

In heat 321, another 1,200-pound heat of the same composition as before, the zinc was charged first, then half of the borings, which were unusually bulky, was added. The furnace was rocked to aid in smoking off the oil, and the arc was run a few minutes, using 13 kilowatt-hours. The borings charged had shrunk enough that the rest of the borings could be added without being piled too thickly around the arc. The copper and billet ends were added last. After a total of 187 kilowatt-hours had been used by the arc and 4 by the motor, the charge was poured. The first ingot, poured from the first ladle before any billets were poured, was analyzed, also the last ingot from the heel of the second ladle, poured after all four billets had been poured, with the following results: First ingot, first ladle, 59.76 per cent copper; last ingot, second ladle, 59.54 per cent copper.

In heat 323, a 1,200-pound charge, of the same composition as before, was used. The borings were charged in two parts—the first part being heated a little before the second was added. Then the copper and the billet ends were charged. After 166 kilowatt-hours had been used, the zinc was added and 22 kilowatt-hours more was put in. The rocking motor used 4 kilowatt-hours.

The first and last ingots from this heat analyzed as follows:

First ingot, first ladle, 59.78 per cent copper; last ingot, second ladle, 59.66 per cent copper. These figures indicate the thorough mixing obtained by rocking.

The metal losses in these runs were not obtained, but the analysis shows that the calculated 60 per cent copper content was closely approached.

Speltering first worked just as well metallurgically as speltering last, and made working conditions pleasant for the attendants, as well as saving much time and preventing the loss of heat in removing the door and stopping to spelter.

By running the electrodes hot enough to keep the condensed zinc molten and, on 10-hour operation, by removing the electrodes and cleaning them and the sleeves of deposited zinc before the furnace cools enough for the zinc to solidify, the sticking of the electrodes should be entirely eliminated, as there was no sign of sticking on these last six runs.

No zinc smoke was emitted from the clearance between the electrode and the sleeve until the metal was within a few degrees of the proper pouring temperature for billets. The amount of zinc lost by volatilization about the electrodes was not enough to make an appreciable loss on a 1,200-pound charge.

Only 14 heats, in all, were made in the commercial size furnace on extrusion metal that required speltering.

As the Michigan Smelting & Refining Co. wished to use the furnace for regular production of red brass, the experiments with extrusion

metal cartridge brass, or similar alloys high in zinc could not be continued long enough to show what the power consumption and output for such alloys would be under other than experimental conditions. However, as the melting points and the pouring temperatures of these alloys are lower than those of the red brasses, the power consumption attainable should be lower than the figures obtained in melting red brass.

Because of the relatively small amount of experimental work done with the furnace at Detroit on alloys requiring the addition of much spelter, no such definite statements can be made regarding the behavior of the furnace in melting these materials, as can be made regarding its performance with red brass, and alloys containing up to 30 per cent zinc, from scrap or other previously alloyed material.

However, the results of the experimental work so far indicate that after a few weeks development of the rocking electric furnace under rolling-mill conditions, it should melt alloys high in zinc as satisfactorily as the various other alloys so far melted in quantity in this furnace.

VITAL POINTS IN REDUCING POWER CONSUMPTION.

The main way to attain a low power cost is to cut down the idle time of the furnace as much as possible. If the furnace were run 24 hours on 1,350-pound charges heated to 1,160° C., charging in 10 minutes and pouring in 5 minutes, as is easily possible, a heat could be made in 1 hour 20 minutes, the arc being on 1 hour 5 minutes. Thus 18 heats or an output of 24,000 pounds per day could be made. The power consumption, metered on the primary circuit, would be about 250 kilowatt-hours per ton. This would be an output of about 1,000 pounds per hour or about 50 per cent more than that on 10-hour operation with ladle delays, thus decidedly cutting the interest charges on the investment.

Every effort should be made to keep the waste time in charging and pouring down to the minimum, and to hold the power input up while running. The heats should be made on the basis of power input, measured in kilowatt-hours, and not on a time schedule alone.

HEAT BALANCE.

In heats 197 to 208, two days, 20 hours' running time, 15,650 pounds of alloy, mostly 79 per cent Cu, 9 per cent Sn, 10 per cent Pb, 2 per cent Zn, was poured at an average temperature of 1,175° C. (2,150° F.). The power consumption, metered on the secondary, was 2,224 kilowatt-hours for the arc, and 28 for the motor; total, 2,252.

Richards ^a gives 7 kilowatt-hours per 100 pounds as the theoretical power needed to heat an alloy of 65 per cent Cu and 35 per cent Zn, or one of 85 per cent Cu and 15 per cent Sn to 10 per cent above their melting points (915° and 965° C.), or to only 1,006° and 1,056° C., respectively. These temperatures are not high enough for satisfactory pouring.

Hansen ^b gives 8.13 kilowatt-hours as the amount of power theoretically necessary for heating 100 pounds of 80 Cu, 20 Zn alloy to 1,100° C.

As a rough approximation one may take 8 kilowatt-hours per 100 pounds, or 160 per ton, as the theoretical value for the leaded bronze heated to 1,150–1,175° C. This figure is probably low rather than high.

As the ratio of the kilowatt-hour reading on the primary meter, when that was installed for test, to the kilowatt-hour reading on the secondary meter was 109:100, the power consumption becomes: Kilowatt-hours used on arc circuit, 2,446; on motor circuit, 28; total, 2,474, or 317 kilowatt-hours per ton. The heat balance on 10-hour operation is then about as follows:

Heat balance of rocking furnace working on 10-hour schedule.

	Kilowatt-hours.	Per cent.
Loss in transformers and leads.....	222	9
Power used by motor for rocking the furnace.....	28	1
Loss in cooling water:		
7.5 kw. per hour for 20 hours (2 days).....	150	8
2 kw. (estimated) per hour for 28 hours (2 nights).....	56	
Power usefully applied (theoretical), 15,650 pounds at 8 kilowatt-hours per 100 pounds melted.....	1,252	51
Balance left for shell radiation losses, 48 hours, and door losses, while charging—12 charges.....	766	31
Total.....	2,474	100

Of the 2,224 kilowatt-hours actually supplied to the furnace itself, 1,252 was usefully applied, giving a 56 per cent efficiency on that basis.

In 24-hour operation, in heats 274 to 301, two days, 45 hours and 40 minutes, running time, 36,500 pounds of metal, mostly 75½ per cent Cu, 4½ per cent Sn, 14½ per cent Pb, 3 per cent Sn alloy, and partly 84 per cent Cu, 6 per cent Sn, 10 per cent Pb alloy, was melted and poured at an average temperature of about 1,175° C. The power used by the arc, metered on the secondary side, was 4,159 kilowatt-hours, and that by the motor, 43. The power used by the arc, if metered on the primary side, would become 4,533, the total

^a Richards, J. W., Electric power required to melt metals: Trans. Am. Brass Founders' Assn., vol. 4, 1910, p. 95.

^b Hansen, C. A., Electric melting of copper and brass: Trans. Am. Inst. Metals, vol. 6, 1912, p. 110.

for arc and motor being 4,576. The heat balance is, then, approximately as follows:

Heat balance of rocking furnace on 24-hour schedule.

	Kilowatt hours.	Per cent.
Loss in transformer and leads.....	374	8
Motor.....	43	1
Loss in cooling water (48×7.5).....	360	7½
Power usefully applied (theoretical), 36,500 pounds melted at 8 kilowatt-hours per 100 pounds.....	2,920	64
Balance left for shell radiation 48 hours, and door losses while charging 28 heats.....	889	19½
Total.....	4,576	100

Of the 4,159 kilowatt-hours actually supplied to the furnace itself, 2,920 were usefully applied, giving a 70 per cent efficiency on that basis.

If pouring delays were eliminated and the furnace was run at the rate of 18 heats of 1,350 pounds each in 24 hours, which is easily possible, the efficiency would rise to nearly 70 per cent calculated on the total power supplied to transformer, primary, and motor, and to about 75 per cent on that actually supplied to the furnace itself.

By increasing the capacity of the furnace to 1 ton or more, and by using the roof part for a refractory that would permit feeding power to the furnace at a slightly higher rate, an efficiency of at least 70 per cent, based on the total power supply, should be attained. That is, with the improvements being incorporated in the furnaces now building, the rocking type of furnace, if run with minimum delays in charging and pouring, is probably capable of reaching a power consumption figure of about 225 kilowatt-hours per ton of metal poured in melting red brass heated to about 1,150° C.

Comparison of melting costs with rocking electric furnace and with coke-fired furnaces.

[Melting cost comparison per ton of metal charged (labor cost is assumed to be the same in coke and electric melting and is omitted). Metal heated to 1,160° C. Conditions as at Michigan Smelting & Refining Co. plant.]

COKE-FIRED FURNACES.

	Normal cost.	Present cost.
Coke.....	\$1. 20	\$2. 00
Crucibles.....	1. 40	12. 50
Total.....	2. 60	14. 50

ELECTRIC FURNACE.

	10-hour day.	24-hour day.
Power.....	\$3. 40 ^a	\$2. 65 ^b
Interest and depreciation.....	1. 50	1. 00
Electrodes.....	. 80	. 80
Linings.....	. 40	. 40
Heating ladles.....	. 25	. 25
Incidentals.....	. 25	. 25
Total.....	6. 60	5. 35
Credit 1.5 per cent, or 30 pounds, metal saved over coke-fired furnaces, at 15 cents.....	4. 50	4. 50
Total.....	2. 10	1. 20
Calculated saving:		
10-hour electric melting over coke melting, present conditions, \$14.50—\$2.10=\$12.40.		
24-hour electric melting over coke melting, present conditions, \$14.50—\$0.85=\$13.65.		
10-hour electric melting over coke melting, normal conditions, \$2.60—\$2.10=\$0.50.		
24-hour electric melting over coke melting, normal conditions, \$2.60—\$0.85=\$1.75.		

POWER CONSUMPTION IN RELATION TO FUEL SUPPLY.

An average of 33 pounds of coke is required to melt 100 pounds of metallic charge in the Michigan Smelting & Refining Co.'s practice, using the large No. 250 crucibles, or at 13,000 B. t. u. per pound of coke, 429,000 B. t. u. per 100 pounds of metallic charge or 8,580,000 B. t. u. per ton is required. This is good practice for natural-draft crucible furnaces. One rolling mill figures that to melt one pound of 70:30 cartridge brass 5,460 B. t. u. are required, or 10,920,000 B. t. u. per ton, when the fuel used is about 90 per cent anthracite coal and 10 per cent coke.

According to Dow^c a modern central-station steam power plant can produce 1 kilowatt-hour from 20,000 B. t. u. (bituminous coal), and 80 per cent of the power produced can be delivered at the customer's terminals. That is, it takes 25,000 B. t. u. to deliver 1 kilowatt-hour to the high-tension side of the customer's transformer.

In a five-day test, with 10-hour operation, the rocking furnace used 327 kilowatt-hours, primary meter, per ton of charge, corresponding to 8,175,000 B. t. u. In a four-day test, with 24-hour operation, the furnace used 264 kilowatt-hours per ton of charge, corresponding to 6,560,000 B. t. u.

^a 340 kilowatt-hours, metered on primary, at 1 cent per kilowatt-hour.

^b 265 kilowatt-hours, metered on primary, at 1 cent.

^c Dow, A., The production of electricity by steam power, Trans. Am. Electrochem. Soc., vol. 32, 1917, p. 352.

Taking 564,000 B. t. u. (160 kilowatt-hours) as the theoretical amount required to melt a ton of brass, the coke-fired furnaces at 8,580,000 B. t. u. are giving about 6.6 per cent efficiency. The generation of electric power from coal at 25,000 B. t. u. per kilowatt-hour, where the theoretical requirement is only 3,400 B. t. u., gives 13.6 per cent efficiency. The efficiency of the rocking furnace in the five-day test (10-hour operation) was 49 per cent, so that the over-all efficiency, after conversion of coal into electric power, is about 6.65 per cent. In the four-day test (24-hour operation) the efficiency was 61 per cent and the over-all efficiency was 8.27 per cent. The efficiency of the coke-fired furnaces in 24-hour operation would not be more than 7.5 per cent. A similar comparison of open-flame oil furnaces and of the electric furnace using power generated by oil engines would show about the same actual fuel consumption per ton in each.

Hence, on a B. t. u. basis, the use of electric power for melting brass in the rocking furnace does not require the ultimate consumption of any more fuel than natural-draft coke fires. Where hydro-electric power is available, no fuel is needed for the electric furnace.

Therefore the use of the electric furnace has no drawback compared with coke-fired furnaces as regards the use and transportation of fuel and has the advantages of eliminating crucibles, decreasing metal losses, and not requiring operators of as great muscular ability. These factors are of especial importance under the conditions brought about by the war.

It is not enough to know that the rocking furnace, under such conditions as obtain at the plant where it was tested, is capable of reduced melting costs over coke-fired furnaces, but other fuel-fired furnaces and other electric furnaces should be compared, though space is lacking to give detailed comparison here.

Open-flame oil furnaces work well on alloys low in zinc or lead and eliminate crucible costs. On true bronzes, with charges containing few borings, the melting costs, considering the higher metal losses in the open-flame furnace, would be about the same as in the electric furnace operating 10 hours daily. With alloys higher in zinc or lead, or with large amounts of borings, the metal losses in the open-flame furnace will probably throw the balance in favor of the electric, even with the low labor cost of the former.

In comparison with other electric brass furnaces ready for commercial use, the rocking type appears to have a flexibility superior to many types and second to none; that is, it can melt a wide range of alloys, in large or small charges, permit making successive heats of different alloys, and will run on a 10-hour day schedule without requiring night heating, as well as on a 24-hour schedule. The metal losses will be as low for a given alloy and charge as those

of any other electric furnace, and for alloys containing volatile metals the losses will be lower than with direct-arc or unrocked indirect-arc furnaces.

The cost of refractories and electrodes will probably be no greater than those working under good practice for other electric furnaces. On the score of low power consumption the rocking furnace will show, for a given size of furnace and length of working-day, far better results than the furnaces in which heating is mainly by radiation from the roof, and rather better than the results that can be gotten with direct-arc or stationary indirect-arc furnaces. The power consumption will be somewhat higher than in the vertical-ring induction furnaces.

In sharp control of temperature and in thorough mixing of the metal the rocking type is equaled by the vertical-ring induction furnace, but no other type approaches it in those respects.

The first cost of the rocking furnace in a given size should compare favorably with the prices of the other types on the market, although, as with all electric furnaces, a large capital outlay is required on account of the high first cost as compared with that of fuel-fired furnaces. This initial cost, at least under present conditions, will be promptly repaid by the savings the furnace will make.

The disadvantages of the rocking type of furnace are as follows: Unless the furnace is made in capacities of considerably more than 1 ton, a single-phase arc is practically required, as there is scarcely room enough for two pairs of electrodes to enter through the ends of the furnace and still give convenient clearance everywhere. A single-phase load of the wattage needed, particularly an arc load, which at times fluctuates rapidly, may not be acceptable to the central station. This is no drawback in Detroit, nor would it be in most cities or large manufacturing towns, but in localities where the power circuit is of small capacity, it might bar the furnace from use.

The attendant must watch the furnace rather closely in order to adjust the angle of rocking to the progress of the heat; also, he must exercise some judgment in this adjustment. The electrodes may be broken from rocking the furnace too far while the charge is still solid, and, on the other hand, the angle of rocking should be kept as large as possible in order to keep the power consumption down and increase the life of the lining. A more refractory roof part may be expected to make such constant care less essential, though still desirable. The contacts on the rocking-control mechanism must be kept clean, and the bearings of the furnace rollers and gears must be kept lubricated.

Relining is a trifle more difficult when the roof part does fail than in a furnace with a detachable roof which can be promptly replaced with a spare roof, for the furnace must be cooled enough to let the

mason go inside. Hence, the use of a high-grade refractory, such as zirkite, in the roof and upper halves of the ends, may be desirable in this type of furnace, the high initial expense being repaid by less frequent need for repairs and fewer interruptions of service. When large repairs to the lining are required, time would be saved if a crane of sufficient lifting capacity were available to turn the furnace on end, so it could be lined like a pit furnace.

These disadvantages all spring from the necessary design of a rocking type of furnace, and would appear to be overbalanced by the advantages of accurate temperature control, thorough mixing of the charge, low metal losses, applicability to alloys high in zinc, and lowered power consumption, which the rocking type has as compared with an unrocked indirect-arc furnace.

The rocking furnace, then, on the basis of tests in which 3,500,000 pounds of metal was melted, seems to deserve consideration in comparison with fuel-fired furnaces and with other types of electric furnaces. There are many plants where fuel-fired furnaces or other electric furnaces may meet local conditions better than the rocking furnace, but it would seem that the plants where it would meet local conditions more satisfactorily than other furnaces are numerous enough to make further development of the rocking type and more exact determination of its ability in comparison with other furnaces desirable.

FURTHER IMPROVEMENT AND DEVELOPMENT OF THE ROCKING FURNACE.

After the results of the tests recorded herein had been tabulated and studied the representatives of the Bureau of Mines and those of the Detroit Edison Co. revised the design of the furnace. The chief changes made are increasing the diameter of the hearth to 45 inches, instead of 36 inches, to bring the capacity of the furnace to 1 ton, and, of course, increasing the power input proportionally to the increase in weight of charge; slightly enlarging the door to facilitate charging; altering the electrode holders and the support for the slide to allow more rapid and convenient handling; lengthening the travel of the holder in order to permit drawing the electrodes farther back while charging; using a graphite sleeve or a granular packing to prevent sticking of the electrodes; and trying zerkite brick for the upper half of the inner course of the lining.

Two furnaces of the improved design are now under construction for the C. B. Bohn Foundry Co., of Detroit, which plans to use them in making munition castings. The original furnace after the addition of graphite sleeves about the electrodes is now (May, 1918) being used for regular production by the Michigan Smelting & Refining Co., and four furnaces of the improved design are being built for

this firm. Also, the Aluminum Castings Co. has ordered four furnaces of this type and is contemplating the installation of two additional furnaces.

ACKNOWLEDGMENTS.

Grateful acknowledgment is made to Cornell University for the use of its electric furnace laboratory, to the Hays Manufacturing Co., the Lumen Bearing Co., F. W. Reidenbach, the Riverside Metal Co., and the Connecticut Metal & Chemical Co. for loan of material for melting in some of the laboratory tests, to Dr. J. M. Lohr, formerly of the Bureau of Mines, for aid in the early laboratory tests, to the Detroit Copper & Brass Rolling Mills, the Michigan Smelting & Refining Co., and the Detroit Edison Co., and, in particular, to Mr. E. L. Crosby, of the last-mentioned firm, for cooperation in the tests made at Detroit.

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INDEX.

A.		Page.		Page.
Aluminum, melting of, difficulties in	52		Direct-arc furnace, merits of	19
melting tests of	52, 53		Dorsey, H. G., cited	12
pouring temperatures of	53		Dow, A., on cost of producing a kilowatt-hour	123
Are in furnace, effect of vapors on	59			
normal length of	59		E.	
Ashes, brass furnace, concentrates from	40-42		Eddy-current furnace, merits of	20
Ajax-Wyatt furnace, merits of	17		Electric furnace, advantages of	7, 11
use of	17		cost of melting with	122
			types of, commercially tested	11
			merits of	19, 20
B.			Electric furnace. <i>See also</i> Power consump- tion	
Bally, T. F., cited	12		Electrode consumption in large furnace	66, 116
Bally furnace, merits of	12, 13		construction of	58
use of	13		Electrodes of laboratory furnace, descrip- tion of	26
Bennett furnace, merits of	15		of large furnace	89
Bragg, C. T., acknowledgment to	108		sticking of, causes of	85
Brass produced in laboratory furnace, com- position of	93		tests regarding	87-93
in tests with large furnace, composi- tion of	72		Extrusion metal, composition of	80, 81, 82, 83
scrap, melting tests of	29-35		losses of, in coke-fired furnaces	84
Bronze from large furnace, composition of	72		in tests with large furnace	84
Bronzes, electric furnaces for melting of, ad- vantages of	11		tests with	116-118
Bureau of Mines, work of	7, 9		in large furnace	79-83
C.			F.	
Carrere, J. M., cited	23		Fitzgerrald, F. A. J., cited	22
Castings. <i>See</i> Copper castings.			Foley furnace, merits of	17
Charging materials in large furnace, method of Clamer, G. H., cited	65		Foundries, brass, work done at	10
10, 11, 16, 17			"Full rock," definition of	55
Coke-fired furnace, cost of melting with	121		Furnace. <i>See</i> Coke-fired furnace, electric furnace, direct-arc furnace, and furnaces named.	
efficiency of	123			
Collins-Valentine furnace, merits of	13		G.	
Concentrates from brass furnace ashes, com- position of	40		General Electric furnace, merits of	13
melting tests of	40, 42		Gillett, H. W., cited	21
power consumption in	42		Granular-resistor furnace, merits of	20
Connecticut Metal & Chemical Co., acknowl- edgment to	126			
Contact-resistance furnace, merits of	20		H.	
Copper castings, melting tests of	51		Hansen, C. A., cited	14
pouring temperature of	51		on Weeks furnace	23
Cornell University, acknowledgment to	126		Hays Manufacturing Co., acknowledgment to	126
Corundite brick lining of large furnace, cost of use of for furnace lining	66		Heat balance of large furnace	120, 121
55, 57			retention of large furnace	70
Crosby, E. L., acknowledgment to	126		Helberger, H., cited	12
on power consumption of large furnace	94		Helberger furnace, merits of	12
on tests of Stassano furnace	24		Hering, C., cited	11, 16, 17
Gullen, J. F., cited	11		Hering furnace, merits of	16
			use of	16
D.			Hoskins furnace, merits of	12
Delays in melting with large furnace, causes of	63, 64			
Detroit Copper & Brass Rolling Mills, ac- knowledge to	70, 126		I.	
Detroit-Edison Co., acknowledgment to	126		Imbert, A. H., cited	22
cooperative test with	54		Indirect-arc furnace, advantages of	24
			merits of	20, 21

	J.	Page.		Page.
Johnston, J., cited.....		21	Pouring temperature of extrusion metal.....	97
Johnson, W. M., cited.....		22	of nickel brass.....	30
	K.		of red brass.....	39-43, 97, 99-105
			of yellow brass.....	39
Keeney, R. M., cited.....		11, 22	Power consumption, effect of size of charge on.....	107
"Krets," melting tests of.....		29, 30, 33, 34, 35	in large furnace.....	106, 110, 111, 113-115
results of.....		36, 37	in melting nickel brass.....	50
Kilowatt hour, cost of.....		122	in tests, significance of.....	19
	L.		methods of reducing.....	119
			of electric furnace, causes affecting.....	95
Labor cost in melting with large furnace.....		70	of laboratory furnace.....	36, 37
Laboratory furnace, losses of nickel brass in.....		50	of large furnace.....	93
melting of manganese bronze in, power consumption for.....		49	tests of large furnace.....	95
Large furnace. <i>See also</i> Power consumption, roasting furnace, arc, and refractory lining electric furnace, furnaces named.			<i>See also</i> Manganese bronze, laboratory furnace, and large furnace.	
Leads for large furnace, construction of.....		60	Power factor of large furnace.....	59
Lohr, J. M., acknowledgment to.....		126	supply of large furnace.....	58
Lumen Bearing Co., acknowledgment to.....		126		R.
Lyon, D. A., cited.....		11, 22	Reactance for current for large furnace.....	89
	M.		Red brass, melting tests of.....	27-37, 42, 43
Manganese bronze, composition of.....		34	results of.....	36, 37, 113
Manganese bronze, losses of, in crucible furnace.....		49	pouring temperatures of.....	36, 43
in laboratory furnace.....		47, 48	Refractory lining of laboratory furnace.....	35
Manganese bronze, melting tests of.....		44-46	of large furnace.....	57
results of.....		47	cost of.....	96
power consumption in.....		49	life of.....	67, 68
pouring temperatures of.....		44, 45, 46	Regulators, automatic, for electrode control, possible use of.....	71
Marsh, A. L., cited.....		12	Reldenbach, F. W., acknowledgment to.....	126
Marsick, Oliver, acknowledgment to.....		57	Rennerfelt, I., cited.....	15, 22
Metal, charges of, weight of, difficulties in determining.....		94	Rennerfelt furnace, merits of.....	15
losses of, in indirect-arc furnaces, causes of in laboratory furnace.....		36, 37, 92	use of.....	15
in large furnace.....		74-77, 116	Riverside Metal Co., acknowledgment to.....	126
difficulty in determining.....		63, 78	Roasting furnace, advantages of.....	7, 24, 57, 123, 124
significance of.....		19	commercial use of.....	126
Melting costs, with coke-fired and electric furnaces.....		121	development of.....	21-24
Michigan Smelting & Refining Co., acknowledgment to.....		126	disadvantages of.....	124
casting methods of.....		61	efficiency of.....	123
cooperative tests with.....		54	laboratory size, construction of.....	25
materials used by.....		61	power consumption of.....	43
Miller, D. D., cited.....		11, 12, 13	tests with, results of.....	27-53
	N.		view of.....	26
Nickel brass, electric furnace for melting of, advantages of.....		49	large size, construction of.....	25
losses of, in laboratory furnace.....		50	cost of.....	60
pouring temperature of.....		50	description of.....	54-59
power consumption in melting tests of.....		50	sections of.....	56
Northrup, E. F., cited.....		18	view of.....	54
Northrup furnace, merits of.....		18	possibilities of.....	9
	O.		Rodenhauser, W., cited.....	11, 16
Oil fired furnaces, advantages of.....		123	Roeber, E. F., cited.....	11
in materials charged, effect of.....		64	Rogers, W. W., acknowledgment to.....	50
vapor, effect of, on arc.....		59	Rolling mills, brass, electric furnaces for.....	10
	P.		Rotating furnace, merits of.....	22
Pouring temperature of aluminum.....		53		S.
of copper castings.....		51	"Safe rock," definition of.....	55
			Schemmann, W., cited.....	16
			Schoenawa, J., cited.....	11, 16
			Schmelz, E. M., cited.....	14
			Smothered-arc furnace, merits of.....	20
			Snyder, F. T., cited.....	14
			Snyder furnace, merits of.....	14
			Speltering, in brass melting, best time for.....	89
			Stansfield, A., cited.....	11
			Stassano, E., cited.....	22

T.	Page.	Y.	Page.
Temperature. <i>See</i> Pouring temperature.		Yellow brass, electric melting of, advantages of	11
Thompson, J., cited.....	22	melting tests of.....	27-37
		results of.....	35, 37
V.		pouring temperatures of.....	39
Valentine, I. R., cited.....	13	tests with, in laboratory furnace.....	87-93
Vertical-ring induction furnace, merits of....	20		
Von Ischewaky, B., cited.....	22	Z.	
W.		Zinc, charging of.....	89
Weeks, C. A., cited.....	22	losses of, in indirect-arc furnaces, causes of.	21
Weeks furnace, tests of.....	23	saving of, by electric brass melting.....	79
Wyatt, J. R., cited.....	17	vapor, effect of on arc.....	69





Bulletin 172

Law Serial 16

DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, SECRETARY

BUREAU OF MINES

VAN. H. MANNING, DIRECTOR

ABSTRACTS OF CURRENT DECISIONS

ON

MINES AND MINING

REPORTED FROM
JANUARY TO MAY, 1918

BY

J. W. THOMPSON



WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

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GENERAL SUBJECTS TREATED.

	Page.
Minerals and mineral lands.....	1
Eminent domain.....	22
Mining terms.....	23
Mining corporations.....	25
Mining partnerships.....	32
Mining claims.....	33
Statutes relating to mining operations.....	38
Mines and mining operations.....	69
Mining leases.....	114
Mining properties.....	140
Quarry operations.....	149
Damages for injuries to miners.....	152
Interstate commerce.....	155
Publications relating to mining laws.....	161



CONTENTS.

	Page.
Minerals and mineral lands	1
Minerals	1
Meaning of term.....	1
Term includes oil and gas.....	1
Injunction to prevent removal.....	1
Title to Mexican bullion—Jurisdiction of Federal Courts to determine.....	1
Title of American citizen to Mexican bullion.....	2
Mineral lands	2
Mineral character—Question of fact.....	2
Subsequent discovery of minerals—Effect on title.....	2
Cutting timber—Liability—Defense.....	2
Prosecution for cutting timber—Court's refusal to direct verdict.....	2
Sale and conveyance	3
Grants by Congress—Policy as to mineral lands.....	3
Validity of patent.....	3
Sale of mineral lands—Breach of covenant—Damages.....	3
Construction of deed and agreement to develop mine—Condition or covenant.....	3
Conveyance of mineral lands—Fraudulent representations— Right to relief.....	4
Fraud in procuring deed—Inadequacy of price.....	5
Reservation of minerals—Construction.....	5
Recovery of public lands—Parties.....	6
Surface and minerals—Ownership and severance	6
Estate in minerals.....	6
Coal and coal lands	7
Coal lands as mineral lands.....	7
Lands purchased from United States—Judicial notice.....	7
Limitation to single entry.....	7
Conveyance of right to mine coal.....	7
Sale and purchase of coal—Fraud.....	8
Sale of coal supposed to exist—Liability.....	8
Sale of coal—Quantity unknown—Liability for minimum price.....	8
Option for extension—Time of exercise.....	8
Lieu selections—Fraud—Annulment of patents.....	8
Action to avoid patent—Proof insufficient.....	9
Fraudulent representations—Recovery of excess royalties— Statute of limitations.....	10
Partition—Mining improvements—Allowance.....	10
Partition—Right of cotenant to improvements.....	10
Coal removed by cotenant—Partition and accounting.....	11
Partition—Enjoining mining operations by cotenant.....	11

Minerals and mineral lands—Continued.	Page.
Oil and oil lands.....	11
Oil and gas as minerals.....	11
Oil and gas are parts of land.....	12
Minerals include oil.....	12
Conveyance of oil and gas in place—Conditions subsequent.....	12
Reservation of minerals—Oil not included.....	12
Contract of purchase and conveyance—Indemnity bond.....	12
Breach of contract to deepen well—Damages.....	13
Right of railroad company to mine oil on its right of way.....	13
Trust—Rights of purchaser with notice.....	13
Jurisdiction to administer oil rights—Receiver.....	14
Natural gas.....	14
Public Service Commission—Regulation of rates.....	14
Dangerous premises—Attractive nuisance—Injury to child.....	14
Gas main—Negligence in maintaining—Liability for injury.....	15
Pipe lines.....	15
Care required of owner—Liability for injuries from escaping gas.....	15
Appropriation of private property—Regulation of rates.....	16
Property devoted to public use—State control.....	16
Public control—Taking of private property.....	16
Regulation by public utilities.....	17
Monopoly—Public control.....	17
Common carrier—Regulation.....	18
Private ownership and operation.....	18
Construction of pipe line—Duty to maintain in safe condition.....	18
Negligence in maintaining—Liability for injury.....	19
Concurrent negligence—Liability.....	19
Land Department.....	19
Special tribunal—Purpose.....	19
Classification of land as mineral or nonmineral—Conclusiveness.....	20
Issuance of patent—Absence of fraud—Finding conclusive.....	20
Issuance of patent—Presumption and conclusiveness.....	20
Public Lands.....	20
Classification—Effect.....	20
Patent passes title.....	20
Railroad grants.....	21
Classification—Grant of lands.....	21
Mining claims located on railroad grant.....	21
Eminent Domain	22
Power to exercise—Public utilities.....	22
Regulation of pipe lines.....	22
Mining terms	23
Jack setter.....	23
Minerals.....	23
“Misfire” hole.....	23
Seam blast.....	23
Skips.....	23
“Snow bird” mines or shippers.....	23
Tool nipper.....	24
Mining corporations	25
Authority of president—Signing notes—Ratification.....	25
Duty to keep office and books within the State.....	25
Issuance of stock without consideration.....	25

	Page.
Liability of trustee for assessments	25
Liability of stockholders—Joint action by creditors.....	26
Guarantors of stock—Liability.....	26
Liability of stockholders for corporate debts—Parties.....	26
Liability of stockholder—Conclusiveness of judgment against corporation.....	27
Sale of stock—Fraud not established.....	27
Right of stockholder to sue on behalf of corporation.....	27
Suit by stockholders—Demand on directors excused.....	28
Judgment against corporation—Fraud in obtaining—Pleading..	28
Foreign corporation—Appointment of process agent.....	28
Foreign corporation—Affidavit for publication.....	29
Dissolution on vote of stockholders—Right to demand certificate.	29
Double taxation.....	30
Exemption from annual license fee.....	30
Liability as assignee of coal lease—Estoppel.....	30
Use of property—Operation of oil well.....	30
Knowledge of rules of first-class mining.....	30
Transporting gas through dangerous pipe—Liability.....	31
Maintaining a dangerous gas main—Liability for injuries.....	31
Mining partnerships	32
Creation and existence.....	32
Actual working of mine not necessary.....	32
Partnership in property to be held by equitable title.....	32
Right to accounting.....	32
Mining claims	33
Mineral character of land.....	33
Finding of Land Department not conclusive.....	33
Patent as an adjudication.....	33
Location of claim.....	33
Location on railroad lands—Priority of right.....	33
Assessment work.....	33
Determination of value.....	33
Work on one claim—Effect on others.....	34
Resumption of work prevents relocation.....	34
Development shaft—Insufficient proof—New trial.....	34
Relocation.....	34
Performance of assessment work—Resumption of work.....	34
Patents.....	35
Presumptions arising from patent.....	35
Holder as trustee.....	35
Avoidance—Subsequent discovery of minerals.....	35
Placer claims.....	35
Mineral character—Right of claimants to reconsideration.....	35
Adverse claim.....	36
Right of party to adverse—Pleading.....	36
Sale and transfer.....	36
Agreement to develop—Consideration for conveyance—Parol proof-of intention.....	36
Agreement to transfer—Effect on title.....	37
Statutes relating to mining operations	38
Construction, validity, and effect.....	38
Application to mine operator.....	38
Regulations for transportation of coal.....	38

Statutes relating to mining operations—Continued.	Page.
Duties imposed on operator.....	38
Duty to furnish props.....	38
Duty of propping.....	38
Duty to warn or instruct.....	39
Inspection—Duty of mine foreman.....	39
Duty to construct traveling way around shaft—Crossing bottom of shaft.....	39
Willful violation—Meaning—Question of fact.....	40
Violation by operator.....	40
Want of knowledge—Burden of proof.....	40
Failure to inspect miner's working place.....	40
Pleading—Insufficient charge of violation—Use of safety lamp.....	41
Competency of miner to use safety lamp—Proof.....	41
Negligence per se.....	42
Willful failure to perform duty—Liability.....	42
Safe working place.....	43
Duty of operator—Notice of dangerous condition in the roof.....	43
Liability for failure to provide safe place—Presumption and burden of proof.....	43
Relative duty of operator and miner—Miner's working place.....	43
Safe appliances.....	44
Failure to supply safe appliance.....	44
Duties imposed on miner.....	44
Miner's duty to prop working place.....	44
Duty to inspect roof after blast.....	44
Duty to prop working place.....	45
Failure to exercise care—Defense.....	45
Violation by miner.....	45
Violation by mine manager—Liability for damages.....	45
Right to recover for injury.....	46
Custom not sufficient excuse.....	46
Emergency not a sufficient excuse.....	46
Miner's working place.....	47
Duty of miners to make place safe.....	47
Knowledge of danger—Effect on exercise of care.....	47
Negligence of mine superintendent or foreman.....	47
Duty of inspection—Extent and liability.....	47
Shift boss—Vice principal.....	48
Authority as vice principal.....	48
Authority of shift boss—Authority as vice principal—Liability of operator.....	48
Shift boss as vice principal.....	48
Fellow-servant rule—Defense abrogated.....	48
Negligence of fellow servant no defense.....	48
Effect on contributory negligence.....	49
Defense abrogated.....	49
Violation of statute—Defense abrogated.....	49
Violation of statute enacted for safety of employees.....	49
Contributory negligence as proximate cause.....	49
Violation by miner defeats recovery.....	49
Recovery notwithstanding contributory negligence.....	50
Exercise of care—Question of fact.....	50

Statutes relating to mining operations—Continued.

	Page.
Effect on assumption of risk	50
Defense abrogated	50
Negligence of employer—Defense abrogated	51
Defense restricted	51
Risks traceable to employer's negligence	51
Operator without negligence	51
Violation of statute made for safety of employees	51
Failure to ventilate—Assumption of risk not applicable	51
Continuing to work with knowledge of negligence	52
Knowledge of danger—Continuing to work without promise of repair	52
Exercise of care—Negligence of operator	52
Negligence of fellow servant—Risk not assumed	52
Custom	53
Effect on statutory regulation	53
Employer's Liability Act	53
Constitutionality	53
Construction and application	53
Construction—Questions of fact	53
Pennsylvania Employer's Liability Act—Construction	53
Action by injured miner—Right of recovery	54
Death of miner—Liability—Pleading	54
Pleading—Sufficient statement of facts	54
No liability without negligence	55
Injury as proximate result of employment—Assumption of risk ..	55
Employer's want of knowledge of danger—Employee's assump- tion of risk	55
Liability of employer—Superintendence delegated	55
Industrial Insurance Law	56
Nature and construction of Washington's Industrial Insurance Law	56
Washington's Industrial Insurance Law—Construction and pur- pose	56
Workmen's Compensation Act	56
Alaskan Workmen's Compensation Act—Construction	56
Construction—Annual earnings—Meaning	57
Sections of Iowa Act construed together—Basis for annual earnings	57
Purpose and construction—Masterial duties	57
Relation of employer and employee—Right to compensation	58
Action for injuries—Pleading	59
Pleading—Statement of cause of action—Negating defense	59
Action for injuries—Presumption and pleading	59
Injuries arising "out of and in the course of employment"— Meaning	60
Accident arising in course of employment—Burden of proof	60
Injury while in scope of employment—Negligence—Prima facie case	60
Workmen's Compensation Act of Alaska is elective—Elective provisions	61
Employer's election not to pay compensation—Proof of negli- gence	61

Statutes relating to mining operations—Continued.

Workmen's Compensation Act—Continued.	Page.
Failure of mine operator to elect—Proof.....	61
Rejection by operator—Injury to miner—Presumption of negligence.....	62
Negligence—Presumption from injury.....	62
Findings of Industrial Board—Force and effect.....	62
Award of Industrial Board—Attorney fees.....	62
Appeal from award of Industrial Board—Jurisdiction and authority of court.....	63
Appeal from Workmen's Compensation Board—Final judgment.....	63
Application for judgment—Truth of motion and affidavits—Presumption.....	63
Judgment on award—Interest on past due installments.....	63
Computation of compensation.....	63
Compensation—Deductions for advances.....	64
Average weekly earnings—Computing compensation.....	64
Contributions to support—Dependency not required.....	64
Alaskan Workmen's Compensation Act—Recovery for aggravation of injury.....	65
Repeal of statute—Dependency.....	65
Action for wrongful death.....	66
Application to nonresident allens.....	66
Action by administrator—Pleading.....	66
Time for bringing suit—Statute of limitations.....	66
Declarations of deceased—Proof.....	67
Physician and patient—Privilege waived.....	67
Liens.....	67
Extent.....	67
Assignment of claims—Seperate liens.....	67
Separate contracts not mingled.....	68
Laborer's accounts—Separate liens.....	68
Assignee of miner's lien—Enforcement.....	68
Separate liens—Enforcement.....	68
Mines and Mining Operations.....	69
Relation of master and servant.....	69
What constitutes.....	69
Status—Pleading.....	69
Relation and liability—Question of fact.....	69
Actions—Pleading and proof of negligence.....	70
Pleading negligence—General averments.....	70
Elements of negligence—Pleading and proof.....	70
Pleading and proof of negligence.....	71
Allegations of negligence not inconsistent.....	71
Insufficient charge of negligence.....	71
Evidence insufficient to show negligence.....	72
Proof of subsequent repairs not admissble to prove negligence.....	72
Rejection of Workmen's Compensation Act—Proof of negligence essential.....	73
Statements of injured person—Res gestae.....	73
Action by injured person—Explanation by witness—Res gestae.....	73
Party's right to have case submitted upon issues pleaded.....	73

Mines and Mining Operations—Continued.	Page.
Negligence of operator.....	74
Actionable negligence—What constitutes.....	74
Actionable negligence—Pleading—Presumption.....	74
Elements of actionable negligence.....	74
Violation of duty.....	74
Want of negligence—Matter of law.....	75
Unsafe condition made in progress of work.....	75
Concurrent negligence of operator and fellow servant.....	75
Injury to timberman—Liability.....	75
Failure to prevent miner from using iron tamping bar.....	76
Ventilation—Improper system—Erroneous instructions.....	76
Permitting uncovered hole in mine car track.....	77
Defective pipe line—Injury to children—Liability.....	77
Duty of operator to furnish safe place.....	78
Liability for failure to furnish safe place.....	78
Exercise of care.....	78
Failure to exercise care necessary to liability.....	78
Operator not insurer of miner's safety—Accident not evidence of negligence.....	79
Exercise of care—Exception to the rule.....	79
Notice and time to remedy necessary.....	79
Notice of changed conditions.....	79
Presumption of performance of duty.....	79
Dangers arising in progress of work.....	80
Application of doctrine.....	80
Leaving unexploded charge of dynamite.....	80
Duty to prop roof—Agreement between operator and miner.....	80
Duty to provide safe appliances.....	81
Duty to furnish safe appliances—Continuous inspection.....	81
Furnishing safe place and appliances.....	81
Appliances not furnished by mine operator—Liability.....	81
Miner may assume the operator has discharged his duty.....	81
Exceptions to rule—Simple tool.....	81
Use of simple tool.....	82
Use of unsafe appliances.....	82
Unsafe hook to draw pipe line.....	82
Electrical appliances.....	83
Maintaining uninsulated wires.....	83
Unguarded insulator—Degree of care.....	83
Liability for death of electrician.....	83
Operator's assurance of safety.....	84
Reliance by miners.....	84
Employee's knowledge of defects—Employer's assurance of safety.....	84
Condition of premises—Use by invitee.....	84
Employer's knowledge of defects—Time for repair—Application of rule.....	85
Operator's promise to repair.....	85
Promise to remove cause of danger.....	85
Duty to warn or instruct.....	85
Competency of employee—Warning excused.....	85
Incompetency of miner—Presumption of law.....	86

Mines and Mining Operations—Continued.

	Page
Duty to warn or instruct—Continued.	
Skilled employee presumed to know dangers.....	86
Certificate of competency—Effect on duty to warn.....	86
Proof of custom not to instruct certified miners.....	87
Dangers readily observable.....	87
Unexploded shots—Warning.....	87
Duty as to unexploded shots.....	88
Degree of care required.....	88
Unexploded shots—Safe place.....	88
Duty of operator to warn or instruct miners.....	88
Blasting—Using poor fuses—Increased risk—Burden of proof.....	89
Rules—Adoption and promulgation.....	89
Miner's knowledge of rules—Presumption.....	89
Violation of rule by miner.....	89
Duty to inform miner of rule.....	89
Proof of existence of rules.....	89
Delegation of duty.....	90
Liability for negligence.....	90
Negligence of foreman or officer.....	90
Negligent order.....	90
Liability of operator for negligence.....	90
Negligence of fellow servant.....	90
Gross negligence and willful act.....	90
Gross negligence of superior fellow servant.....	91
Negligence of motorman—Liability of operator.....	91
Miner's working place—Safe place.....	91
Duty of miner to keep safe.....	91
Miner making working place.....	91
Miner making working place safe.....	91
Miner making working place—Changing conditions.....	92
Inspection of roof by miner—Presumption of duty.....	92
Rule requiring miners to examine working place.....	92
Duty of inspection—Assurance of safety.....	93
Application of safe place doctrine to operator of drilling machine.....	93
Dangerous instrumentalities furnished by operator—Negligence implied.....	93
Contributory negligence of miner.....	94
Court may decide as a matter of law.....	94
Pleading—Freedom from—Burden of proof.....	94
Question of fact.....	94
When available as a defense.....	95
Theory of defense.....	95
Proximate cause of miner's death defeats recovery.....	95
Knowledge of defective appliances.....	95
Knowledge of defective appliances—Obeying orders.....	95
Knowledge of danger—Negligence of fellow servant.....	96
Want of knowledge of danger.....	96
Dangers not obvious.....	96
Customary mode of operating trolley pole.....	96
Employee working outside scope of duties.....	97
Declarations of deceased miner—Proof.....	97

Mines and Mining Operations—Continued.**Page.**

Assumption of risk.....	98
Risks assumed.....	98
Doctrine of assumption of risk.....	98
Basis of doctrine.....	98
Risks incident to employment.....	98
Inherent hazards of employment.....	98
Dangers created by miner.....	98
Dangers in working place.....	99
Violation of rule—Failure to inspect.....	99
Miner engaged in creating working place.....	99
Knowledge of conditions—Presumption.....	99
Miner's knowledge of dangerous methods.....	99
Knowledge of operator's negligence.....	100
Negligence of mine operator—What included.....	100
Danger from unexploded shots—Miner's knowledge.....	100
Risks not assumed.....	101
Dangers resulting from operator's negligence.....	101
Negligence of shift boss.....	101
Dangers outside of working place.....	101
Scope of employment.....	101
Miner waiting under directions of superior.....	101
Proximate cause of injury.....	102
Proximate cause defined.....	102
Question of fact.....	102
Methods of determining.....	102
Negligence of operator.....	102
Negligence of employer—Care exercised by employee.....	103
Negligence of operator or of fellow servant.....	103
Negligence of miner—Pleading.....	103
Failure to furnish props—Mistaken judgment of miner.....	103
Intervening agency.....	104
Former appeal—Law of case.....	104
Contracts relating to operations.....	104
Duty to contractee—Liability for injuries.....	104
Independent contractor.....	105
Liability of operator for injuries to.....	105
Methods of operating.....	105
First-class mining—Meaning.....	105
Operation of oil refinery—Lawful business—Liability.....	106
Breach of contract to deepen well—Loss of profits as damages.....	106
Common agency—Liability of joint users.....	106
Mining and shipping coal—Stability of industries.....	107
Right to surface support.....	107
Liability—Proof of damages.....	107
Liability for subsidence of surface—Statute of limitations.....	107
Labor organizations.....	108
Right of mine operator to exclude union miners.....	108
Right of mine operator to labor of miners.....	108
Operator entitled to good will of employees.....	108
Employment under agreement not to join union.....	109
Peaceable methods to organize trade unions—Inducing breaches of contracts.....	109

Mines and Mining Operations—Continued.**Labor organizations—Continued.**

Inducing miners to quit employment.....	Page. 109
Inducing miners to join union—Limitation of right.....	110
Interferences with employees—Unlawful purpose—Injunction.....	110
Right of officers and agents of union to represent workmen.....	110
Efforts to organize a mine as union—Acts enjoined.....	111
Right of laborers to form unions—Proper exercise of right.....	111
Specific performance of contract—Ownership of property.....	112

Nuisance.....

Operation of oil refinery.....	112
Oil refinery—Escape of oil.....	113

Mining leases.....

Leases generally—Construction.....	114
Construction and effect—Estate granted.....	114
Construction—Cancellation—Recovery on theory of pleading.....	114
Construction—Abandonment by sublessee—Duty of sublessor to prevent damages.....	114

Coal leases.....

Construction—Intention of parties.....	115
Construction—Effect as a conveyance.....	116
Presumption as to purpose—Construction.....	116
Construction—Technical terms.....	116
Construction—Subject matter and object—Mining all coal.....	116
Inducement to execution—Construction.....	117
Conveyance of coal with mining rights—Construction.....	117
Action for royalties—Evidence—Statement of account.....	118
Royalties—Lien on fixtures.....	118
Liability of assignee for royalty.....	118
Minimum royalties guaranteed—Liability.....	119
Minimum royalty—Annual payments.....	119
Sublessor's right to minimum royalty.....	120
Action on bond to secure royalties—Conclusiveness or receipt—Question of fact.....	120
Lien on fixtures—Rights as between lessor and seller.....	121
Use of shaft permitted—No recovery for use.....	121

Oil and gas leases.....

Construction and validity.....	122
Construction and nature.....	122
Construction—Lessee's option to surrender—Right of lessor.....	122
Construction—Oral agreement as to payments—Statute of frauds.....	123
Validity—Perpetuities.....	123
Right of lessee to possession.....	123
Right of lessee to specific performance.....	123
Interest of lessee—Nature of oil and gas—Apportionment of royalties.....	124
Death of ancestor—Right of heirs on partition—Effect of partition on lessee's rights.....	124
Partition of leased lands—Rights of separate allottees.....	125
Leasehold reversion—Royalties—Right of widow.....	126
Death of lessor—Dower rights.....	126
Partition of leased lands—Right to royalties.....	126
Payment of royalties by check or deposit.....	127

Mining leases—Continued.

Oil and gas leases—Continued.

	Page.
Payment of royalty to agent—Forfeiture avoided.....	127
Lease of Indian lands—Record as notice.....	127
Trust created by parol—Rights of beneficiaries.....	128
Trust—Creation by parol—Validity.....	128
Ratification of sale or lease by trustee—Rights of beneficiaries— Estoppel.....	128
Duty of lessee to develop and operate wells—Consideration.....	128
Implied covenant to develop.....	129
Implied covenant to develop—Breach and remedy.....	129
Implied covenant to develop—No forfeiture.....	130
Implied covenant to develop separate tracts.....	130
Duty to develop—Intention of parties.....	130
Implied covenant to develop—Suit as a demand.....	131
Failure to require development.....	131
Duty of lessee to develop—Cancellation on failure.....	132
Separate leased tracts—Failure to develop one—Remedy.....	132
Covenant to drill—Lessor's option—Cancellation.....	132
Failure to operate—Liability for damages.....	132
Payments in lieu of drilling—Right of lessor to have lands de- veloped.....	133
Acceptance of rentals—Waiver of covenant to drill.....	133
Abandonment by lessee—Available to assignee of lessor.....	133
Abandonment by lessee—Rights of creditors and of lessors.....	133
Abandonment and forfeiture—Intention.....	134
Forfeiture—Right to declare.....	134
Forfeiture—Pleading—Question of fact.....	134
Forfeiture on ground of abandonment.....	135
Failure to develop—Forfeiture.....	135
Failure to operate wells—Abandonment and forfeiture.....	136
Forfeiture—Erroneous instruction as to right of forfeiture.....	136
Forfeiture of lease—Ordinary care.....	136
Declaration of forfeiture—Tender of stipulated compensation..	136
Interest of lessor—Forfeiture.....	137
Failure to pay royalties—Forfeiture or cancellation.....	137
Forfeiture—Waiver.....	137
Failure to drill—Forfeiture—Waiver by lessor.....	137
Acceptance of rentals—Forfeiture—Estoppel.....	138
Fraud—Cancellation.....	138
Indian lands—Approval of lease.....	139
Written lease—Approval by secretary.....	139
Lease of Indian lands—Approved by mistake of law—Trust.....	139
Unapproved Indian lease not enforceable.....	140

Mining properties.....

Taxation.....

Construction of constitution.....	141
Constitutional provision—Nature of mining property.....	141
Constitutional provision for taxation of mines.....	141
Constitutional provisions—Not self-executing.....	142
Mining property—Taxation of surface.....	142
Taxation of mining machinery—Surface improvements.....	142
Taxation of annual net proceeds of mines.....	142

Mining properties—Continued.

Taxation—Continued.	Page.
Construction of statute—Net proceeds.....	143
Net annual proceeds—Method of reaching.....	143
Taxation of proceeds of mine—Meaning and application of "mine".....	144
Purpose of constitutional provision—Difficulty in making valu- ation of property.....	145
Assessment of coal lands.....	145
Return of property for assessment.....	145
Assessments for taxation—Deduction of expenditures.....	145
Separate assessment of oil—Adding to the agricultural value....	146
Oil lands—Agricultural and mineral valuation.....	146
Mining right—Assessment.....	147
Lease of right to mine coal.....	147
Conveyance of surface—Reservation of minerals—Valuation....	147
Tax on mining corporations—Time of Levy.....	147
Taxation on coal lands—Mandamus to compel officer to act.....	148
Issuance of tax deed—Injunction.....	148
Quarry operations	149
Negligence of operator—Incompetency of foreman.....	149
Operator's knowledge of dangerous condition—Negligent order to employee.....	149
Negligence of foreman—Fellow servant rule not applicable.....	149
Duty of operator to inspect—Question of fact.....	150
Duty of operator to inspect—Assumption of duty performed.....	150
Duty of employer—Risks not assumed by employee.....	150
Assumption of risk—Pleading and proof.....	150
Risks not assumed.....	150
Dangerous condition—Duty to warn employee.....	151
Injury to employee—Opportunity to reach place of safety.....	151
Willful operations—Liability.....	151
Damages for injuries to miners	152
Elements of damages.....	152
Earning capacity—Absence of wage scale.....	152
Recovery by minor.....	152
Expectancy of boy.....	152
Damages for loss of time—Pleading.....	152
Expense of medical attention—Cross examination.....	153
Matters properly considered in estimating damages.....	153
Witness improperly influenced.....	153
Fraud in procuring settlement—Subsequent suit—Refunding con- sideration.....	153
Damages not excessive.....	154
Instances.....	154
Interstate commerce	155
Power of State to control public utilities.....	155
Jurisdiction of public utilities commission.....	155
Review of order of public service commission.....	155
Authority of public service commission—Distribution of coal cars....	155
Rule of railroad company for distribution of coal cars—Basis and validity.....	156

Interstate commerce—Continued.

	Page.
Power of State to control distribution of coal cars.....	156
Distribution of coal cars—Regulation by State.....	157
Distribution of coal cars—Construction of statute.....	157
Distribution of coal cars—Liability of railroad company.....	157
Allotment of coal cars—Cars furnished on sidings.....	158
Allotment of cars for coal shipments—Open-top and box cars.....	158
Classification of mines—Distribution of open and closed cars.....	158
Loading cars from wagons—Classification of cars.....	159
Team track loading mines—Demand for equal car service denied.....	159
Team track loading—"Snowbird" mines—Distribution of cars.....	160
Transportation of natural gas—Power of State to regulate rates....	160
Natural gas—Storing and transportation.....	160

62860°—19—Bull. 172—2

TABLE OF CASES.

	Page.
Aaron v. Rothrock, — Kan. —, 169 Pac. 1161-----	14, 123, 128
Alderson v. Horse Creek Coal Land Co., — W. Va. —, 94 S. E. 716-----	10, 11, 41, 42, 54, 66
Alford v. Dennis, — Kan. —, 170 Pac. 1005-----	129, 130, 131, 132, 135
Alverson v. Little Cahaba Coal Co., — Ala. —, 77 So. 547-----	66, 69, 70, 77, 86, 91, 95, 98
Anlicker v. Gunsburg, 38 Supreme Ct. Rep. 228-----	139, 140
Associated Pipe Line Co. v. Railroad Commission, — Cal. —, 169 Pac. 62-----	16, 18, 22
Atlas Oil Co. v. Standard Oil Co., 142 La. —, 77 So. 471-----	13
Auxford Brown Ore Co. v. Hudson, — Ala. —, 77 So. 243-----	113

B.

Baltimore & Ohio Railroad Co. v. Public Service Commission, — W. Va. —, 94 S. E. 545-----	24, 38, 107, 155, 156, 157, 158, 159, 160
Barclay v. Wetmore-Morse Granite Co., — Vt. —, 102 Atl. 493-----	23, 149, 150, 151
Barnes v. Esch, — Ore. —, 169 Pac. 512-----	1
Barry v. Badger, — Mont. —, 169 Pac. 34-----	70, 78, 79, 94, 99
Beacat Mining Co. v. Grasselli Chemical Co., 247 Fed. 286-----	115
Beatty Oil & Gas Co. v. Blanton, 245 Fed. 979-----	123, 127
Beveridge v. Illinois Fuel Co., — Ill. —, 119 N. E. 46-----	59, 61
Benoit Coal Mining Co. v. Faught, — Ala. —, 77 So. 695-----	104, 105, 153
Berry v. Rombauer Coal Co., — Mo. App. —, 198 S. W. 1130-----	67, 68
Bingham Mines Co. v. Blanco, 246 Fed. 936-----	66, 73
Black Panther Oil & Gas Co. v. Swift, — Okla. —, 170 Pac. 238-----	14
Blair v. Brownstone Oil & Refining Co., — Cal. App. —, 170 Pac. 160-----	13, 106
Borderland Coal Co. v. Edwards, — Ky. —, 100 S. W. 792-----	71
Brown v. Kittanning Clay Products Co., — Pa. —, 102 Atl. 948-----	90, 91, 94, 96, 97, 101, 103, 152, 154
Bruce Coal Co. v. Bibby, — Ala. —, 77 So. 545-----	70
	80, 119, 120

C.

Campbell v. Lynch, — W. Va. —, 94 S. E. 439-----	12, 114, 124, 125
Carter Coal Co. v. Filipeck, — Ky. —, 201 S. W. 468-----	84, 93, 96, 154
Caulkins v. Wyoming Coal Mining Co., — Wyo. —, 171 Pac. 265-----	83, 87
Cavoretto v. Alaska Gastineau Mining Co., 245 Fed. 858-----	74
Charles v. Elk Horn Mining Co., — Ky. —, 200 S. W. 461-----	76, 79, 92
Charleston South Carolina Mining & Manufacturing Co. v. United States, 246 Fed. 828-----	6
Chrowell v. Howard, — Tex. Civ. App. —, 200 S. W. 911-----	13, 30
Clark v. Butler Junction Coal Co., — Pa. —, 102 Atl. 952-----	77, 152, 153
Clinton Mining & Mineral Co. v. Cochran, 247 Fed. 449-----	26, 27
Cobb v. Atlantic Coast Line Ry. Co., — N. C. —, 95 S. E. 92-----	151
Colburn v. Simpson, — Kan. —, 170 Pac. 383-----	122
Consolidated Coal & Coke Co. v. Music, — Ky. —, 199 S. W. 1074-----	82
Consolidated Coal Co. v. Deskins, — Ky. —, 199 S. W. 779-----	80, 84, 90
Corrigan v. Oklahoma Coal Co., — Okla. —, 171 Pac. 47-----	41, 74, 80, 102, 103, 104

D.

Dellinger v. Smith, 142 La. —, 77 So. 947-----	138
Dennis v. Gibson, — Iowa —, 165 N. W. 1080-----	40, 46, 47, 50
Dieterle v. Harris, — Okla. —, 169 Pac. 873-----	138

E.

Elk Horn Mining Corp. v. Pitts, — Ky. —, 201 S. W. 9-----	75, 83, 102
Elk Horn Mining Corp. v. Vahoose, — Ky. —, 200 S. W. 921-----	45, 47, 75, 80, 89, 99
Ellamar Mining Co. v. Possus, 247 Fed. 420-----	56, 57, 60, 61, 65
Erickson v. Maple Block Coal Co., — Iowa —, 167 N. W. 105-----	39, 43, 44, 47, 61, 62, 75, 81

F.

Federal Mining & Smelting Co. v. Anderson, 247 Fed. 472-----	48, 90, 93, 101
Fuginiti v. Diamond Coal & Coke Co., — Pa. —, 103 Atl. 51-----	153

G.

Greenfield v. Minnesota Mining & Developing Co., — Minn. —, 165 N. W. 274-----	27, 28
--	--------

H.

	Page
Haddaway Curd Coal Co. v. Breece, Trenton Mining Co., — Mo. App. —, 200 S. W. 104	8
Haggard v. McGrew Coal Co., — Mo. —, 200 S. W. 1072	23, 72, 79, 92
Hamilton-Collison Hdwr. Co. v. Arkansas City Oil & Gas Co., — Kan. —, 169 Pac. 190	134
Hammalstedt v. Bakely, — Iowa —, 166 N. W. 729	3, 5, 6
Hammond v. United States, 246 Fed. 40	2, 8
Harper v. Sloane, — Cal. —, 169 Pac. 1043	82
Hart v. Appalachian Washed Coal Co., — Tenn. —, 201 S. W. 515	118, 121
Haynes v. Fisher Oil Co., 142 La. —, 77 So. 781	71, 82, 83
Helms v. Eastern Kansas Oil Co., — Kan. —, 169 Pac. 208	106, 113
Hitchman Coal & Coke Co. v. Mitchell, 28 Supreme Ct. Rep. 65	108, 109, 110, 111, 112
Horse Creek Land & Mining Co. v. Midkiff, — W. Va. —, 95 S. E. 26	1, 6, 11, 12, 23

J.

Jackson v. Texas Co., 143 La. —, 76 So. 187	15, 16, 77
James v. P. E. Steifer Mining Co., — Cal. App. —, 171 Pac. 116	25, 28
Jellick v. Jamison Coal & Coke Co., — Pa. —, 103 Atl. 300	87, 88, 89, 90
Johnson v. Armstrong, — W. Va. —, 94 S. E. 753	122, 123, 132, 133, 137, 138
J. Woolley Coal Co. v. Tevaut, — Ind. —, 118 N. E. 921	40
	42, 45, 47, 49, 50, 51, 52, 53, 54, 55, 91, 95, 98, 103

K.

Kirk v. Olson, 38 Supreme Ct. Rep. 114	38, 86
Kirlicks v. Texas Co., — Tex. Civ. App. —, 201 S. W. 687	131, 135

L.

La Habra Oil Co. v. Francis, — Cal. App. —, 169 Pac. 401	25
Landon v. Public Utilities Commission, 245 Fed. 950	14, 155, 160
Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Fed. 432	53, 76, 81, 86, 87, 90, 100
Leslie v. Ebner, — Ind. App. —, 118 N. E. 829	27
Loveless v. Cunard Mining Co., — Mo. App. —, 201 S. W. 375	44, 49, 102, 154

M.

Mammoth Mining Co. v. Juab County, — Utah —, 170 Pac. 78	141, 142, 143, 144, 145, 146
Massie v. Eldorado Gold Star Mining Co., — Cal. App. —, 171 Pac. 814	25
Mayhan Jellico Coal Co. v. Bird, — Ky. —, 201 S. W. 306	75, 94, 99, 104
McKirahan v. Gold King Mining Co., — S. Dak. —, 165 N. W. 542	33, 84
McMurray v. Peabody Coal Co., — Ill. —, 118 N. E. 29	62, 63
Melton v. Cherokee Oil & Gas Co., — Okla. —, 170 Pac. 691	123, 124, 135
Mitchell v. Swanwood Coal Co., — Iowa —, 166 N. W. 391	39
	43, 44, 47, 50, 51, 52, 58, 59, 61, 62, 74, 81
Mohr v. North Rawhide Development & Mining Co., — Cal. —, 170 Pac. 800	37
Moreno v. New Guadalupe Mining Co., — Cal. App. —, 170 Pac. 1088	28, 24, 67
Morgan v. Sunflower Zinc Co., — Mo. App. —, 199 S. W. 590	84, 85, 90, 94, 95
Moyer v. Butte Miners' Union, 246 Fed. 657	112
Munsey v. Marnet Oil & Gas Co., — Tex. Civ. App. —, 199 S. W. 686	12
	129, 133, 134, 135, 136, 137

N.

National Coal Co. v. Overholt, — W. Va. —, 94 S. E. 785	8, 10, 118
Northern Central Coal Co. v. Barrowman, 246 Fed. 906	81, 84
Northern Pacific B. Co. v. Musselshell County, — Mont. —, 169 Pac. 58	141
	142, 143, 144, 145, 147, 148

O.

Old Dominion Copper Mining & Smelting Co. v. State Board of Taxes & Assessments, — N. J. —, 103 Atl. 79	29, 30, 148
Overton v. Noyes, — Cal. —, 170 Pac. 1110	25

P.

Palmer Co. v. Police Jury, etc., 142 La. —, 78 So. 122	146
Peabody Coal Co. v. Industrial Board, — Ill. —, 117 N. E. 983	65
Peterson v. Otho Development & Power Co., — S. Dak. —, 166 N. W. 147	23
	85, 88, 89, 98, 100, 101
Pittsburgh Block Co. v. Olive Coal Co., — Pa. —, 103 Atl. 52	118, 121
Pringle v. Carthage Quarry Co., — Mo. App. —, 199 S. W. 581	98, 150, 151
Producers' Transportation Co. v. Railroad Commission, — Cal. —, 169 Pac. 59	16
	17, 18, 22

R.

Rakle v. Jefferson & Clearfield Coal Co., 259 — Pa. 534, 103 Atl. 302	63
Rembarger v. Losch, — Ind. App. —, 118 N. E. 829	114, 134, 137
Ricaud v. American Metal Co., 38 Supreme Ct. Rep. 212	2
Richard v. Central Iowa Fuel Co., — Iowa —, 166 N. W. 1059	57, 64
Ririe v. Randolph County Assessor, — Utah —, 169 Pac. 941	7, 145, 148
Rock Island Coal Mining Co. v. Toletkis, — Okla. —, 171 Pac. 17	52, 98
Ross v. Erickson Construction Co., 89 Wash. 634, 155 Pac. 153	56

S.

	Page.
Salzer v. Consolidation Coal Co., 246 Fed. 794.....	66
Scioto Oil Co. v. O'Hern, — Okla., — 169 Pac. 483.....	127, 139
Simmons Coal Co. v. Board of Review, etc., — Ill., — 118 N. E. 753.....	7, 116, 147
Sloss-Sheffield Steel & Iron Co. v. Russell, 247 Fed. 289.....	55, 81, 96
Staggs v. Gotham Mining & Milling Co., — Mo. App., — 199 S. W. 717.....	101
Starcher v. South Penn Oil Co., — W. Va., — 95 S. E. 28.....	15, 19, 31, 73, 85, 107
State Public Utilities Commission v. Baltimore, etc., R. Co., — Ill., — 118 N. E. 81.....	155, 158
Sterts v. Industrial Insurance Commission, 91 Wash. 588, 178 Pac. 256.....	56
Sugar Valley Coal Co. v. Drake, — Ind. App., — 117 N. E. 987.....	58, 60, 62, 69

T.

Thomas v. Horst, — Mont., — 169 Pac. 781.....	2, 3, 19, 20, 21, 33, 35
---	--------------------------

U.

Union Coal & Coke Co. v. United States, 247 Fed. 106.....	7
Union Trust Co. v. Wear Coal Co., — Mo., — 199 S. W. 230 81, 106, 115, 116, 117, 120, 122	122
United States v. Porter Fuel Co., 247 Fed. 769.....	9, 10, 20, 35
United States v. Sweet, 38 Supreme Ct. Rep. 193.....	3, 7
Urich v. Utah Apex Mining Co., — Utah —, 169 Pac. 263.....	71, 78, 93, 99, 101

V.

Vandalia Coal Co. v. Butler, — Ind. App., — 119 N. E. 84.....	46, 54, 152
Vinton v. Pratt, — Mass., — 117 N. E. 919.....	26
Virginia Iron, Coal & Coke Co. v. Crigger, — Ky., — 201 S. W. 298.....	5

W.

Walsh v. Kansas Fuel Co., — Kan., — 169 Pac. 219.....	107, 108
Wendzinski v. Madison Coal Co., — Ill., — 118 N. E. 485.....	88
	89, 40, 42, 46, 53, 61, 73, 87, 95
Wesseler v. Brankman, — Colo., — 170 Pac. 189.....	36
Western Coal & Mining Co. v. Watts, — Ark., — 199 S. W. 921.....	38, 45, 49, 50, 51, 104
White v. Hendley, — Cal. App., — 169 Pac. 710.....	4, 87
Wildes v. Lou Dillon Gold Field Mining Co., — Nev., — 170 Pac. 1046.....	29
Woolly Coal Co. v. Tevaut. See J. Woolly Coal Co. v. Tevaut.	

ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING, JANUARY TO MAY, 1918.

By J. W. THOMPSON.

MINERALS AND MINERAL LANDS.

MINERALS.

MEANING OF TERM.

The term "minerals" when employed in a conveyance in the State of West Virginia is understood to include every inorganic substance which can be extracted from the earth for profit, whether it be solid, as rock, fire clay, the various metals and coal, or liquid, such as salt, and other mineral waters and petroleum oil and gas.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 28, p. 27.

TERM INCLUDES OIL AND GAS.

The term "minerals" used to describe the interest in land granted or reserved bona fide includes petroleum oil and natural gas.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 28, p. 27.

INJUNCTION TO PREVENT REMOVAL.

The removal of ore from the premises of another without his consent will be enjoined.

Barnes v. Esch (Oregon), 169 Pacific, 512, p. 513.

TITLE TO MEXICAN BULLION—JURISDICTION OF FEDERAL COURTS TO DETERMINE.

Where bullion within the jurisdiction of the Mexican Government was seized, condemned, and sold for war supplies by the Constitutionalist forces in the revolution acting under authority from Gen. Carranza, claiming to be the provisional President of the Republic of Mexico, a United States district court of Texas, into which State the bullion has been imported from Mexico, has jurisdiction to try and adjudge as to the validity of the title acquired by

and through the seizure, appropriation, and sale by the Carranza forces as against an American citizen claiming ownership of such bullion prior to its seizure.

Ricaud v. American Metal Co., 38 Supreme Ct. Rep. 212, p. 213.

TITLE OF AMERICAN CITIZEN TO MEXICAN BULLION.

The seizure, condemnation, and sale of bullion in Mexico sold for war supplies by the constitutionalist forces, acting under authority of the provisional president of the Republic of Mexico, had the effect of divesting the title to and ownership by a citizen of the United States who was not in or a resident of the Republic of Mexico at the time of the seizure, condemnation, and sale.

Ricaud v. American Metal Co., 38 Supreme Ct. Rep. 212, p. 214.

MINERAL LANDS.

MINERAL CHARACTER—QUESTION OF FACT.

Whether a particular parcel of land is mineral or nonmineral in character presents a question of fact dependent for its solution upon evidence dehors the record.

Thomas v. Horst (Montana), 169 Pacific, 731, p. 732.

SUBSEQUENT DISCOVERY OF MINERALS—EFFECT ON TITLE.

Under the land-grant act of July 24, 1864 (31 Stats., 365), a patent to the Northern Pacific Railroad Company passes the legal title to the land free from the contingency of future discovery of minerals in the land conveyed.

Thomas v. Horst (Montana), 169 Pacific 731, p. 732.

CUTTING TIMBER—LIABILITY—DEFENSE.

By the act of March 3, 1891 (26 Stats., 1093), in any criminal prosecution or civil action by the United States for a trespass on the public timber lands in the States of Colorado, Montana, Idaho, North Dakota, South Dakota, Wyoming, and in the District of Alaska and the gold and silver regions of Nevada and the Territory of Utah. it shall be a defense if the defendant shall show that the timber was cut or removed for use in the State or Territory by a resident thereof for mining and for certain other purposes, and that it has not been transported out of such State or Territory.

Hammond v. United States, 246 Federal 40, p. 45.

PROSECUTION FOR CUTTING TIMBER—COURT'S REFUSAL TO DIRECT VERDICT.

In a prosecution for unlawful cutting and removing timber from public land, where the evidence introduced by the defendant tended

to show that the lands were mineral lands within the meaning of the act of June 3, 1878 (20 Stats., 88), and that the person cutting the timber had complied with the provisions of the act and with the rules established thereunder by the Secretary of the Interior, the court may properly refuse to direct a verdict for the defendant where the defendant justified the cutting under the act of June 3, 1878 (20 Stats., 88), and where the evidence showed trespasses committed subsequent to the amendatory act of March 3, 1891 (26 Stats. 1093).

Hammond v. United States, 246 Federal 40, p. 45.

SALE AND CONVEYANCE.

GRANTS BY CONGRESS—POLICY AS TO MINERAL LANDS.

In the legislation concerning the public lands it has been the purpose of Congress to make a distinction between mineral lands and other lands, to deal with them along different lines and to withhold mineral lands from disposal save under laws specially including them. It has been the policy of the Government at all times to reserve the mines for the use of the United States.

United States v. Sweet, 38 Supreme Ct. Rep. 193.

VALIDITY OF PATENT.

A patent issued for public or mineral lands not open to entry under the act by virtue of which it is issued is absolutely void.

Thomas v. Horst (Montana), 169 Pacific 731, p. 732.

SALE OF MINERAL LANDS—BREACH OF COVENANT—DAMAGES.

In an action for a breach of a covenant of a deed reserving and excepting the minerals, a recovery of nominal damages only can be had for the breach of the covenant of seisin where there has been no eviction or actual damages shown, and where there is no allegation that the owner of the underlying minerals has entered upon the surface, or that any substantial damages have resulted from the alleged breach of the covenants of the deed.

Hammalstedt v. Bakely (Iowa), 166 Northwestern 729, p. 731.

CONSTRUCTION OF DEED AND AGREEMENT TO DEVELOP MINE—CONDITION OR COVENANT.

The owner of certain mineral lands conveyed the same to a nephew by ordinary deed of conveyance. At the same time the parties entered into an agreement providing, among other things, that the grantee in the deed would undertake the opening up and development of the property as a mining claim at his own expense; and

providing that the grantor should during his lifetime occupy the premises as a place of residence and obtain therefrom such income as might be necessary to afford him a comfortable living; and that during his lifetime the property should be developed in a proper and systematic manner as a mining claim for the benefit of both; and providing that the property may be sold at a sum in excess of the amount expended by the grantee in the deed who was to be reimbursed for all moneys expended by him in the development of the property, together with interest thereon, and receive the entire proceeds of any such sale except an amount necessary to provide for the care and maintenance of the grantor during his lifetime. The expressed intention was to give the grantee of the premises the entire benefit of all the property conveyed with the right to proceed with the opening up and development thereof and to obtain the full benefit to be derived therefrom except that the grantor of the premises was to be provided for during his lifetime. The deed and the written agreement constitute one instrument and must be construed together. The grantee in the deed wholly failed to develop the property according to the agreement. The agreement construed with the deed does not create a condition subsequent, but is a mere covenant to develop the land. There is an entire absence of apt or appropriate words or expressions usually employed for the purpose of creating a condition subsequent, but the language employed implies a personal covenant and not a condition. The language indicates positively an intention to transfer to the grantee free from condition the full interest and benefit of the property. The expressed intention was not to give the grantee the property on condition that he proceed with the opening up and development thereof, but to transfer to him the full and beneficial right to do so. There was no agreement or understanding that the failure to do the act as promised should be a condition or in any way affect the validity of the deed or entitle the grantor to a reconveyance.

White v. Hendley (Cal. App.), 169 Pacific 710, p. 711.

CONVEYANCE OF MINERAL LANDS—FRAUDULENT REPRESENTATIONS—
RIGHT TO RELIEF.

The owner of a tract of mineral lands sold and conveyed the same to the complainant by a deed "excepting and reserving all coal and minerals underlying all said premises." The purchaser brought an action to recover damages for fraudulent representations made by the seller and his agent in that they represented that they owned all the surface and that the owner of the coal and minerals reserved had no contract for or right to use any of the surface of the land described; that in carrying out the fraudulent scheme the seller and

his agent produced an abstract of the title and fraudulently concealed therefrom the fact that the deed conveying the mineral rights reserved the surface rights to mine the same. The complainant knew at the time of accepting the deed that the mineral rights in the lands purchased had been theretofore conveyed to a third person. The deed conveying the minerals authorized the grantee to enter upon the premises described and use such part of the surface as might be required for properly mining the minerals, including the erection and maintenance of hoisting machinery, air pumps, and escape shafts with all necessary rights of way for roadways and other road facilities. The complainant's theory of fraud and fraudulent representations is not sufficient to authorize a recovery of damages, for the reason that the exception and reservation of the coal and minerals underlying the premises, as stated in his own deed, implies and carries with it the right to enter upon the surface and sink shafts, erect machinery, and provide all necessary facilities for handling and removing the coal after the same has been mined. The fact that the deed conveying the minerals expressly recited and conveyed privileges to the mineral grantee could not give the purchaser of the surface a right to recover, although fraudulent representations were in fact made, and especially where a deed conveying the minerals reserved to the surface owner conditions more favorable than were stated in the deed conveying the surface to the complainant.

Hammalstedt v. Bakely (Iowa), 166 Northwestern 729.

FRAUD IN PROCURING DEED—INADEQUACY OF PRICE.

A father owned one half of certain mineral lands and his son owned the other half, subject to the life estate of the father. The father conveyed his interest in the minerals under the entire tract of land, and by request the son joined in the deed. The son could not, six years after the death of the father, maintain an action to set aside the deed on the ground of fraud, where the preponderance of the evidence showed that the son thoroughly understood that he was conveying his interest in the minerals and that his father was to receive \$90 and himself \$10 as the consideration for the conveyance of the minerals. The gross inadequacy of price can not be regarded as a badge of fraud where there were other considerations expressed in the deed.

Virginia Iron, Coal & Coke Co. v. Crigger (Kentucky), 201 Southwestern 298.

RESERVATION OF MINERALS—CONSTRUCTION.

A deed conveyed certain described lands in West Virginia "excepting and reserving all the minerals, coals, together with all necessary rights of way of ingress and egress to and from, over, through,

or under said premises to mine, excavate, and transport the same, excepting a sufficiency of said coals for domestic use." The effect of the deed would be to pass all the estate or interest the grantor then had but for the reservation. If only the term "minerals" had been employed, there could then be no question of the grantor's purpose to reserve all minerals. But the word "coals" immediately following minerals was used presumptively for the same purpose and was evidently used for no other purpose than to define particularly the thing reserved. The term "coals" is here used to qualify the term just preceding it, the two meaning the same thing or being used to designate a single thing. Under the construction given and under the rule that deeds are construed most strongly against the grantor when there is doubt the reservation was of the coal only and not of other minerals.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 28, p. 27.

RECOVERY OF PUBLIC LANDS—PARTIES.

The United States brought suit to recover land in the State of Florida claimed to be mineral and alleged to have been obtained by false affidavits as to its mineral character. The purchaser, after obtaining title, mortgaged the entire tract to the Central Trust Company of New York, and the mortgage remained unpaid at the date of the commencement of the action. The action to recover the land could not be maintained without making the holder of the mortgage a party defendant. This rule can not be avoided on the ground that the land in controversy constituted an unimportant part of the mortgage security, as constitutional rules and equitable principles protecting property rights apply as well to small amounts of property as to large.

Charleston South Carolina Mining & Manufacturing Co. v. United States, 246 Federal 828.

SURFACE AND MINERALS—OWNERSHIP AND SEVERANCE.

ESTATE IN MINERALS.

Coal deposits or other minerals, when separated by grant or reservation in a deed, are as much of an estate in lands as is the surface of the same land. A conveyance or a reservation of minerals or a mineral estate carries with it the right to use so much of the surface estate as may be reasonably necessary for the proper use of the mineral estate.

Hammalstedt v. Bakely (Iowa), 166 Northwestern 729, p. 731.

COAL AND COAL LANDS.

COAL LANDS AS MINERAL LANDS.

Land valuable for coal is mineral land within the meaning of the public-land laws.

United States v. Sweet, 38 Supreme Ct. Rep. 193.

LANDS PURCHASED FROM UNITED STATES—JUDICIAL NOTICE.

Courts take judicial notice of the fact that the coal lands in the State of Utah purchased from the United States were not purchased at a uniform price per acre. Judicial notice is also taken of the fact that the coal lands purchased from the State are not of uniform value and that a blanket assessment for taxation can not be made under constitutional and statutory provisions requiring such assessments on the price paid the United States for coal lands.

Ririe v. Randolph County Assessor (Utah), 169 Pacific 941, p. 942.

LIMITATION TO SINGLE ENTRY.

The United States coal statutes (sec. 2350, Revised Statutes of United States) authorizes but one entry by the same person or association of persons. It is also provided that no association of persons any member of which shall have taken the benefit of the statute, either as an individual or as a member of any other association, shall enter or hold any other land, and no member of any association which shall have taken the benefit of the statute shall enter or hold any other land. The restriction to one entry in the statute must be given full effect. To hold that an individual or any association could make several coal entries provided the total amount of land filed upon did not exceed the maximum allowed by the statute would be to read out of section 2350 the words, "only one entry." This does not deny the right to a person to enter coal lands for a coal company in the absence of evasions as to quantity; but when the coal company has received the benefit of an entry by one person it can not make another entry either by itself or by an agent.

Union Coal & Coke Co. v. United States, 247 Federal 106, p. 107.

CONVEYANCE OF RIGHT TO MINE COAL.

A conveyance of a right to mine, excavate, and remove coal underlying a tract of land is a sale of the coal itself and is a conveyance of an interest in land, and such interest when conveyed is assessable for taxation separately from the surface of the land.

Simmons Coal Co. v. Board of Review, etc. (Illinois), 118 Northeastern 753, p. 754.

SALE AND PURCHASE OF COAL—FRAUD.

The question of whether a company buying coal of a coal-mine operator and selling the same to a coal dealer was guilty of fraud and made false representations as to the quality of the coal is one of fact.

Haddaway Curd Coal Co. v. Breece, Trenton Mining Co. (Mo. App.), 200 Southwestern 104, p. 107.

SALE OF COAL SUPPOSED TO EXIST—LIABILITY.

When parties contract with relation to coal supposed but not known to exist, and the lessee covenants to produce and mine a minimum amount and to pay a minimum royalty within and at stated intervals, his covenant is for a diligent prosecution of the work and to produce the minimum quantity of the minerals if it exists and not whether it exists or not.

National Coal Co. v. Overholt (West Virginia), 94 Southeastern 735, p. 738.

SALE OF COAL—QUANTITY UNKNOWN—LIABILITY FOR MINIMUM PRICE.

Where parties contracted with reference to a coal vein known to exist in a tract of land, but the quantity was unknown and incapable of certain ascertainment and the purchaser covenanted to mine and bring forth a minimum quantity of the product annually, or at other intervals, and to pay a minimum royalty therefor whether mined or not, the contract amounts to a sale of the mineral in the land and the lessee is bound to pay the minimum price whether mined or not and whether it existed or not.

National Coal Co. v. Overholt (West Virginia), 94 Southeastern 735, p. 738.

OPTION FOR EXTENSION—TIME OF EXERCISE.

Where the lease of coal lands with the right to mine and remove the coal in a specified term, and where such lease gave the lessee an option to extend or renew the lease beyond its term for the purpose only of mining and removing coal from adjoining or other lands owned or leased by the lessee over and through the mine and openings in the leased premises and upon terms specified therein the lessee must elect to exercise such right within the term of the lease and he can not do so after the term of the original lease has expired.

National Coal Co. v. Overholt (West Virginia), 94 Southeastern 735, p. 739.

LIEU SELECTIONS—FRAUD—ANNULMENT OF PATENTS.

An action was instituted on behalf of the United States against certain corporations to vacate patents issued for public coal lands on

the ground of fraud. The fraud charged was that the lands covered by the patents were at the several dates of their respective forest lieu selections known as coal lands enterable only under the coal-land act and not enterable as forest lieu selections and that they were at the time known to be such by the respective selectors and entry people whose affidavits to the contrary were alleged to be false. The act of June 3, 1878 (20 Stats., 89), known as the timber and stone act, provides that nothing in the act shall defeat or impair any bona fide claim or authorize the sale of any mining claim or the improvements of any bona fide settler of lands containing gold, silver, cinnabar, copper, or coal. It also provides for filing with the register of the proper district a written statement in duplicate by the entryman to the effect that the land does not, as the applicant believes, contain any valuable deposit of coal, and that the applicant must prove to the satisfaction of the Land Office that the land apparently contains no valuable deposits of coal. In the selection of lieu lands under the act approved June 6, 1900 (31 Stats., 614), such lands shall be confined to vacant, surveyed, nonmineral public lands subject to homestead entry. Mineral lands are not liable to entry and settlement under the homestead law. To justify the annulment of a homestead patent as wrongfully covering coal lands, it must appear that the known conditions at the time of the patent proceeding were plainly such as to engender the belief that the land contained coal deposits of such quality and in such quantity as would render their extraction profitable and justify expenditures to that end.

United States v. Porter Fuel Co., 247 Federal 769, p. 771.

ACTION TO AVOID PATENT—PROOF INSUFFICIENT.

In an action by the United States to avoid patents for coal lands the Government can not succeed where the evidence does not show that the land itself gave evidence of containing valuable deposits of coal at the time of their selection and at the time of the patent proceedings. The proof in the case showed that the sedimentary deposits in the region where the lands were located were cretaceous rock and that they embraced Dakota sandstone, the Macose shales, the Mesa Verde formation, the Lewis shales, and the Laramie sandstone. The Mesa Verde formation is from 700 to 1,000 feet in thickness, and this is the formation in which coal is found in the region where the land was located, and there was some proof to show that this formation extended under these lands; but the evidence also showed that this formation does not always contain coal. The evidence, viewed as a whole, is not convincing that at the time the several entry people made their entries they knew or had good reason to know that the lands in question apparently contained valuable coal deposits and

that, with such knowledge, they deliberately and intentionally swore to the contrary.

United States v. Porter Fuel Co., 247 Federal 769, p. 774.

**FRAUDULENT REPRESENTATIONS—RECOVERY OF EXCESS ROYALTIES—
STATUTE OF LIMITATIONS.**

A lessee in a coal lease sued the lessor to recover excessive royalties paid on the coal purchased and to be mined on the ground of alleged fraudulent representations or assurances on the part of the lessor as to the acreage and tonnage of coal and by reason of which the lessee was induced to enter into the lease and to agree to pay a minimum price for the coal. There was no warranty of acreage or quantity of coal, but there was a warranty of title and quiet and peaceable possession only. In such case a right of action for excess payments of royalties could be founded alone on fraud and deceit alleged, and such an action would be barred by the statute of limitations in five years from the date of the lease and the date when the cause of action accrued, where no reason is alleged why the deficiency of acreage was or could not be discovered before that time and where there is no allegation of obstruction by the lessor.

National Coal Co. v. Overholt (West Virginia), 94 Southeastern 735, p. 733.

PARTITION—MINING IMPROVEMENTS—ALLOWANCE.

A cotenant who has made improvements on coal lands for the purpose of mining coal can not in an action for partition ask both that the portion of the land on which the improvements are made be assigned to him and that he be allowed the value of the improvements. If partition can be made he is entitled to have the portion of the land on which the improvements are made assigned to him; but if such partition can not be made in justice to all cotenants, he may, when such fact is made to appear, claim an allowance for the improvements made by him.

Alderson v. Horse Creek Coal Land Co. (West Virginia), 94 Southeastern 716, p. 719.

PARTITION—RIGHT OF COTENANT TO IMPROVEMENTS.

The fact that a cotenant located upon a particular part of the land owned by the cotenants and enhanced its value by making improvements for mining and removing coal is a circumstance worthy of consideration by a court charged with the duty of making partition of the land among the cotenants. If in making partition the part so improved can be assigned to the cotenant making the improvements without doing injustice to the other cotenants, such assignment will be made. It is the duty of a court making partition of land among cotenants to cause improvements to be assigned to the respective par-

ties who made them, so far as it can be done consistently with an equitable partition of the estate. The rule applies to improvements made upon coal lands with a view to mining the coal.

Alderson v. Horse Creek Coal Land Co. (West Virginia), 94 Southeastern 716, p. 719.

COAL REMOVED BY COTENANT—PARTITION AND ACCOUNTING.

Where the partition of coal lands can be made so as to give one cotenant the part upon which he has placed improvements and from which he has mined coal, then the question will arise as to an accounting for the coal mined and the improvements made if the cotenant is entitled to compensation therefor. A commission for partition to whom the case was referred to take an account was properly directed to ascertain the amount of coal removed from the land and the value thereof, but if the part of the land from which the coal was taken is assigned to the cotenant taking the same as though the coal still remained in it, then it would be improper to charge him anything for the coal extracted therefrom. But if an equitable partition can not be made by assigning this part of the land to the cotenant making the improvements, this information may be valuable to the court in awarding compensation to the other cotenant for the coal extracted from the common estate.

Alderson v. Horse Creek Coal Land Co. (West Virginia), 94 Southeastern 716, p. 720.

PARTITION—ENJOINING MINING OPERATIONS BY COTENANT.

A court of equity will take jurisdiction at the suit of one cotenant to enjoin waste being committed on the joint estate by another cotenant by the mining and removal of coal therefrom; but where it appears that the mining operations are of such character that the land from which the coal is taken may consistently with the equitable partition of the land be assigned to the cotenant mining the coal therefrom, and it also appears that great damage would result from enjoining the operations of the mining of the coal, a court of equity will refuse such relief and in partitioning the land will assign the part from which coal has been mined to the cotenant who removed the coal therefrom.

Alderson v. Horse Creek Coal Land Co. (West Virginia), 94 Southeastern 716, p. 719.

OIL AND OIL LANDS.

OIL AND GAS AS MINERALS.

Petroleum oil and natural gas are mineral, and in their places are real estate and part of the land.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 26, p. 27.

OIL AND GAS ARE PARTS OF LAND.

Oil and gas adhere to the land and are parts of it until severed.

Campbell v. Lynch (West Virginia), 94 Southeastern, 739, p. 743.

MINERALS INCLUDE OIL.

The term "minerals" used to describe the interest in land granted or reserved prima facie includes petroleum oil and natural gas unless it appears that the term was employed in a more restrictive sense.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 26, p. 27.

CONVEYANCE OF OIL AND GAS IN PLACE—CONDITIONS SUBSEQUENT.

By the terms of a written agreement all of the oil, gas, and other minerals beneath the land described were sold and conveyed to the grantee, to have and hold the same on condition that drilling for oil and gas was begun and diligently prosecuted within 30 days from the grant. If oil or other mineral was discovered within that period, the grant was to continue in force for 20 years, or so long as oil could be produced in paying quantities. The grant expressly declared that it evidenced a conveyance of property and not a mere franchise. The agreement by its terms evidenced an absolute sale of all minerals beneath the land subject to the condition subsequent in relation to locating and bringing the oil to the surface; and this being complied with the grant became absolute for the purposes contemplated by the parties for a period of 20 years, or as long as oil in paying quantities could be produced.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 688.

RESERVATION OF MINERALS—OIL NOT INCLUDED.

A deed conveying certain lands in West Virginia, dated May 15, 1891, contained a reservation of minerals as follows: "to have and to hold with all the appurtenances thereto belonging, excepting and reserving all the minerals, coals, together with all the necessary rights of way of ingress and egress to and from, over, through, or under said premises, to mine, excavate, and transport the same, excepting a sufficiency of said coals for domestic use." This clause is a reservation of the coal only, and is not a reservation of the oil and gas.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 26, p. 27.

CONTRACT OF PURCHASE AND CONVEYANCE—INDEMNITY BOND.

A producer of oil gave to a purchaser and a pipe-line owner transporting the oil a bond to indemnify and save harmless the pipe-line

owner and to entitle the oil producer to receive his proportion of the proceeds of the oil to be delivered into the pipe line, and to save the pipe-line owner harmless as against claims pending and threatened against the oil so delivered and to be delivered to the pipe-line owner. The pipe-line owner under the protection of the bond paid to the oil producer large sums for the oil supplied, but refused to pay for the remainder to the extent of the amount of the bond. The acceptance of the solvent bond under the agreement between the parties was sufficient to bind the pipe-line owner for the payment of oil to the amount stipulated in the bond and render him liable for any deficiency between the amount paid and the face of the bond.

Atlas Oil Co. v. Standard Oil Co., 142 Louisiana, 77 Southern 471, p. 474.

BREACH OF CONTRACT TO DEEPEN WELL—DAMAGES.

An oil and refining company entered into a contract by which the contractee agreed to deepen a well at an agreed price for each foot of increased depth. The company agreed to supply all tools, machinery, and appliances to be used in the performance of the work. The contractee proceeded to a certain stage of his work when further prosecution was stopped by the refusal of the company to furnish a certain cable needed in the operations, and which it was bound to supply under the agreement. Under a count for damages the contractee proved the amount of his expenditures and the value of his services. These items constitute the correct element of damages under the rule that a party who voluntarily and wrongfully puts an end to a contract and prevents the other party from performing it is estopped from denying that the injured party has not been damaged to the extent of his actual loss and outlay fairly incurred and for his own services.

Blair v. Brownstone Oil & Refining Co. (Cal. App.), 170 Pacific 160.

RIGHT OF RAILROAD COMPANY TO MINE OIL ON ITS RIGHT OF WAY.

A deed to a railroad company conveyed the fee in the land used by it for its right of way. Under such a conveyance the railroad company can not be enjoined or restrained either from leasing its land for oil development or from itself drilling oil wells and extracting oil therefrom upon its land. The fact that the wells on the railroad company's right of way will drain the oil from adjoining lands is not a sufficient ground for the exercise of the restraining power of a court of equity.

Chrowell v. Howard (Texas Civ. App.), 200 Southwestern 911, p. 912.

TRUST—RIGHTS OF PURCHASER WITH NOTICE.

An oil and gas lease was executed in the name of one of the members of a group of buyers who took title for the benefit of all. The

fact that the prospective purchaser of the lease was informed by one of the beneficiaries that he owned a sixth interest in the lease was sufficient to put the purchaser from the trustee on inquiry and to prevent him from obtaining higher rights than were held by the beneficiaries.

Aaron v. Rothrock (Kansas), 169 Pacific 1161.

JURISDICTION TO ADMINISTER OIL RIGHTS—RECEIVER.

The United States began suit to avoid an allotment and patent, and after answer by the defendants a receiver was appointed upon the request of both parties. The receiver, by order of the court, was directed to continue the production of oil and to make an agreement for the development of the land by which the lessee should deliver or pay to the receiver one-fourth of all oil and gas produced, the lessee to be released from any claim of the parties to the action. The court acquired jurisdiction of the property by taking possession thereof by its receiver and thereby withdrew such property from the jurisdiction of every other court and could retain the control of the property until its judgment was completely effectuated and was free from the interferences of all other tribunals, and a party acquiring interest in the property could not in any other court litigate his claim to the royalties.

Black Panther Oil & Gas Co. v. Swift (Oklahoma), 170 Pacific 238.

NATURAL GAS.

PUBLIC SERVICE COMMISSION—REGULATION OF RATES.

The Public Service Commission of Missouri has no power to suspend the schedules of rates agreed upon by the receiver for interstate pipe lines transporting natural gas from Oklahoma through Kansas into Missouri, and it has no power to establish a new rate for natural gas in a city in the State of Missouri. Such acts constitute an attempt directly to interfere with and directly to burden interstate commerce.

Landon v. Public Utilities Commission, 245 Federal 950, p. 954.

DANGEROUS PREMISES—ATTRACTIVE NUISANCE—INJURY TO CHILD.

The doctrine that it is not the duty of a landowner or occupier to exercise care to make it safe for infant children to come upon it without invitation and merely by sufferance has no application to a case where the landowner or occupier has taken no steps to inform the public of his occupancy; and a pipe-line company that established a pipe line for the transportation of natural gas and which from its

defective condition permitted the gas to escape, and which was attractive and dangerous to young children upon land having the appearance of a public highway and used by the public, including the children of the community, and failed either to give notice that the place was not open to the public or to take the proper precaution to protect the public, including the children, against the danger that has been created is liable to a child injured by reason of such escaping gas.

Jackson v. Texas Co., 143 Louisiana, —, 78 Southern 187, p. 139.

GAS MAIN—NEGLIGENCE IN MAINTAINING—LIABILITY FOR INJURY.

A company laying and maintaining a gas main on the surface of the ground along and over a traveled way, or upon and over a way where persons are invited to travel, and another company conveying its gas through such main at a high and dangerous pressure may both be liable for injuries to a person traveling on such way and injured by reason of the breaking of the gas main due to the high pressure of the gas. The companies under the circumstances of the case may be liable on either the theory of negligence or on the violation of the duty of a landowner for injury to an invitee caused by the dangerous condition of the premises.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 35.

PIPE LINES.

CARE REQUIRED OF OWNER—LIABILITY FOR INJURIES FROM ESCAPING GAS.

There rests upon the owner of a pipe line conveying natural gas through land commonly used as a public highway in an inhabited place the obligation to exercise vigilance commensurate with the danger and of a character to protect the public in person and property from injury and destruction. In an action for an injury to a child caused by escaping gas it was shown that a leak in the pipe line had existed for five months; that the escaping gas could be heard by passers on the highway; that it was often lighted and could be seen at night throughout the neighborhood; that a child, with other children, attracted to the place by the leaking gas and by reason of the gas being lighted by another child was severely burned and injured. The owner of the pipe line did not learn of the leak until after the injury to the child, but the inspection of the line was perfunctory and insufficient and was not likely to have furnished the information until after some injury had been inflicted or some property destroyed. In such case the pipe-line owner is guilty of negligence in failing to make an earlier discovery of the leak and is liable

for the consequences to the same extent as though the discovery had been made and the leak nevertheless been allowed to continue.

Jackson v. Texas Co., 143 Louisiana, 78 Southern 187, p. 188.

APPROPRIATION OF PRIVATE PROPERTY—REGULATION OF RATES.

A pipe-line company organized for the purpose of transporting oil for hire availed itself of the right of eminent domain in demanding private property for its right of way over which it constructed its pipe line on the ground that it was necessary for use in constructing such pipe line through and by means of which it proposed to serve the public. This must be deemed conclusive evidence of the dedication of such property to the public use, and having acquired its right of way by holding itself out as a common carrier and as an agent of the State in charge of a public use, without which it could not have seized property vested in private ownership, it thereby becomes subject to State control and is within the contemplation of the public-utilities act.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 61.

PROPERTY DEVOTED TO PUBLIC USE—STATE CONTROL.

A pipe-line company voluntarily assumed the duty of and embarked upon a business of a public character in transporting oil for hire, and, subject to compliance with its conditions, it carried everybody's oil to market. A corporation or person who devotes his property to a use in which the public has an interest in fact grants to the public an interest in that use and must submit to be controlled by the public for the common good to the extent of the interest thus created. Conceding its right in the absence of an irrevocable dedication to discontinue the conduct of such public business, nevertheless until such discontinuing its tolls, rules, and regulations are subject to the control of the railroad commission.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 61.

Associated Pipe Line Co. v. Railroad Commission (California), 169 Pacific 62, p. 64.

PUBLIC CONTROL—TAKING OF PRIVATE PROPERTY.

A law that deprives a pipe-line company of the beneficial use and free enjoyment of its property or imposes restraint upon such use and enjoyment that materially affects its value without legal process or compensation deprives the company of its property within the meaning of the Constitution. It is not necessary in order to render a statute obnoxious to the restraints of the Constitution that it must

in terms or in fact authorize the actual physical taking of the property, so long as it affects its free use and enjoyment or the power of disposition at the will of the owner. Under these principles the public-utilities act can not authorize the supervision and regulation of rates of a pipe line privately owned and operated.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 65.

REGULATION BY PUBLIC UTILITIES.

Under the public utilities act of California the Railroad Commission is authorized of its own motion or upon the complaint of any person to inquire into any act or thing done by any public utility and to make such order therein as may be necessary to compel any public utility to comply with a law or the orders and rules of the commission. The act does not authorize a proceeding for the sole purpose of inquiring and determining whether a particular person or corporation is carrying on a public utility or is engaged in a private enterprise. The jurisdiction of the commission to make an order regulating a pipe-line company for the transportation of oil dependent upon whether the pipe line was engaged in the business of a common carrier in the transportation of oil, and for the purpose of determining its jurisdiction it was vested with power to determine the facts upon the existence of which it was authorized to make the order.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 61.

MONOPOLY—PUBLIC CONTROL.

The purpose of subdivision (d), Sec. 1 of the California act of 1913, regulating pipe-line companies was to terminate and prevent a monopoly in the oil pipe line business. The fact that a corporation operating a pipe line in transporting oil, a part of which was produced by the company itself, and that it bought crude oil in the fields from independent producers who had no efficient means of shipping their oil to market and contracted to sell their oil to the pipe-line companies at prices agreed upon; that there was no agreement, tacit or otherwise, existing between the pipe-line company and other similar companies as to the price that should be paid in the purchase of oil; that at times the production of oil was largely in excess of the demand therefor and practically no difference was paid by several companies purchasing oil, and convenience and economy in delivery of the oil, both to the purchaser and buyer, could well be deemed a controlling factor in making the purchases, is not sufficient to establish a monopoly created by the pipe-line company interested and is

not sufficient to bring one of the individual pipe lines within the public utilities act and make it subject to the Railroad Commission.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 65.

COMMON CARRIER—REGULATION.

The statute of California provides that every corporation and individual owning or operating any pipe line for the transportation of crude oil or the products thereof, to or for the public, for hire, where such pipe line is constructed or maintained along, over, or under any public highway is a common carrier and subject to the provisions of the public utilities act. The State can not appropriate private property for a public use without just compensation, but when the owner of a pipe line voluntarily devotes it to a public use, or in fact grants to the public an interest in such use, to the extent of the interest so devoted to the public the public may insist on a voice in the control and regulation thereof. This applies to a pipe line used for the transportation of oil for the public and brings it within the jurisdiction of the Railroad Commission.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 61.

Associated Pipe Line Co. v. Railroad Commission (California), 169 Pacific 62, p. 63.

PRIVATE OWNERSHIP AND OPERATION.

A pipe line company that owned and operated oil fields and transported its oil through its own pipe lines, using its property for private use and not devoting its property or pipe line to the use of the public is not subject to control and its rates to regulation by the Railroad Commission under the public utilities act. The fact that it had purchased and transported a comparative small proportion of oil to that produced in its own fields can not constitute it a common carrier or engaged in transporting oil for the public. The fact that "the business is such that the public needs the use in the same, and that the conduct of the same is a matter of consequence," is immaterial on the question of public control and does not change the nature of the private ownership or use.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 65.

CONSTRUCTION OF PIPE LINE—DUTY TO MAINTAIN IN SAFE CONDITION.

An oil and gas company constructing a pipe line across a way used by the public as a highway with the acquiescence of the owner of the land and with the right of the public to use and which right was recognized by the pipe-line company by making provision for preventing the obstruction of the highway by its pipe line, is under the

same obligation to construct and maintain such pipe line in a reasonably safe condition as though the right of way was in fact a public highway.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 33.

NEGLIGENCE IN MAINTAINING—LIABILITY FOR INJURY.

A company operating for oil, having a private road from the place of its operations to the public highway, which agrees to furnish to another for use at another place an appliance owned by it, such appliance to be removed by the party desiring its use, thereby extends an invitation to such other party to come upon its premises for the purpose of removing such appliance therefrom, and if in the removal of such appliance it be necessary to use such private road of the owner, and in the use thereof the party removing such appliance, or his servant, is injured because of the careless and negligent construction of a pipe line across such road by the owner thereof, the injured party may recover damages sustained by reason of such injury from the party so negligently and carelessly maintaining such pipe line.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern, 28, p. 34.

CONCURRENT NEGLIGENCE—LIABILITY.

Where the concurrent negligence of two or more persons combined together resulted in an injury to a third person, he may recover from either or all. In determining the liability of either person so negligent the comparative degrees of negligence are not to be considered. Each is liable for the whole, although the other was capable of contributing in a greater degree to the injury, but the proportion in which the negligence of each contributed to the injury or the degrees of care used is not to be considered. The rule applies to a pipe-line company owning and operating a pipe line, and also to a gas company using the pipe line as a means of conveying its gas.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 35.

LAND DEPARTMENT.

SPECIAL TRIBUNAL—PURPOSE.

The Land Department is a special tribunal created by law for the purpose of determining the conflicting claims arising over the public lands; and a finding of fact by that tribunal upon matters within its jurisdiction is conclusive upon the courts, except for fraud or imposition which prevents the losing party from fully and fairly presenting his case or the officer of that tribunal from properly considering it.

Thomas v. Horst (Montana), 169 Pacific 731, p. 732.

CLASSIFICATION OF LAND AS MINERAL OR NONMINERAL—CONCLUSIVENESS.

When a classification of public lands as mineral or nonmineral under the act of February 26, 1895 (28 Stats., 683), has been completed, the officers of the Land Department are not authorized or permitted thereafter to examine into the character of the land for which a patent is applied, but by reference to the records it is determined from the classification made whether the particular land was mineral or nonmineral in character.

Thomas v. Horst (Montana), 169 Pacific 731, p. 733.

ISSUANCE OF PATENT—ABSENCE OF FRAUD—FINDING CONCLUSIVE.

In an action by the United States to cancel and vacate patents to public lands when the question of fraud is eliminated then the finding of the land officers of the Government that the lands were not coal lands is conclusive upon that question.

United States v. Porter Fuel Co., 247 Federal 769, p. 774.

ISSUANCE OF PATENT—PRESUMPTION AND CONCLUSIVENESS.

The execution and record of a patent are the final acts of the officers of the Government for the transfer of its title and as these can be performed only after certain steps have been taken, the patent duly signed, countersigned and sealed, not merely operates to pass the title but is in the nature of an official declaration by that branch of the Government to which the alienation of the public lands is entrusted that all the requirements preliminary to its issuance have been complied with. The presumptions thus attending a patent are not open to rebuttal in an action at law; and it is this unassailable character which gives to the patent its chief and, in fact, its only value as a means of quieting its possessor in the enjoyment of the lands it embraces.

Thomas v. Horst (Montana), 169 Pacific 731, p. 733.

PUBLIC LANDS.**CLASSIFICATION—EFFECT.**

A classification of public lands as mineral or nonmineral under the act of Congress of February 26, 1895 (28 Stats., 683), sets at rest for all time the question of the mineral or nonmineral character of the land.

Thomas v. Horst (Montana), 169 Pacific 731, p. 733.

PATENT PASSES TITLE.

Where the Land Department has jurisdiction the legal title passes when patent issues for any part of the public land.

Thomas v. Horst (Montana), 169 Pacific 731, p. 732.

RAILROAD GRANTS.**CLASSIFICATION—GRANT OF LANDS.**

It is expressly provided in the act of February 26, 1895 (28 Stats., 683), that no patent or grant shall be made to the Northern Pacific Railway Company for any land in the land districts until such land shall have been examined and classified as nonmineral. Accordingly where an allegation is made that a patent has been issued to the Northern Pacific Railroad Company, the presumption is that the issuance of the patent is in the nature of a judicial determination that every fact has been found which was necessary to entitle the patentee to the legal title to the land and is tantamount to an allegation that the land conveyed was duly classified as nonmineral, and that such classification was approved before any valid mineral locations were made upon the land.

Thomas v. Horst (Montana), 169 Pacific 731, p. 733.

MINING CLAIMS LOCATED ON RAILROAD GRANT.

Pursuant to the act of Congress of February 26, 1895 (28 Stats., 683), certain lands in Montana within the limits of the grant to the Northern Pacific Railway Company were duly classified as nonmineral and in 1907 a patent was issued to the railroad company for such lands. In 1905 and 1906 certain lode-mining claims were located upon portions of the land classified as nonmineral under the act of February 26, 1895, and were subsequently patented to the railroad company. Neither the locator of these claims nor his assignee can hold the same as against a subsequent grantee of the railroad company, notwithstanding the fact that the evidence shows that the particular lands are mineral in character, known to be such for 40 years or more, and that as early as 1893 a patent was issued for a certain quartz lode-mining claim located upon portions of the land in controversy, as the classification as nonmineral and the subsequent issuances of the patent to the railroad company are conclusive of the nonmineral character of the land.

Thomas v. Horst (Montana), 169 Pacific 731, p. 732.

EMINENT DOMAIN.

POWER TO EXERCISE—PUBLIC UTILITIES.

Under the public utilities act of California, the Railroad Commission is an instrumentality of the State, and is authorized to supervise and regulate every public utility in the State, with power to fix tolls and charges against and for the services performed, but the Railroad Commission has no power to declare what will constitute a public utility and the legislature itself possesses no such power. It can not by edict make that a public utility which in fact is not and take private property for public use by its fiat that the property is being devoted to a public use. It can not declare that every corporation owning a pipe line through and by means of which it transports oil is a common carrier and subject to the provisions of the public utilities act. The legislature has no power to declare any pipe line to be a common carrier unless in fact it is such. A pipe-line company transporting the oil produced by it in its own field, and not engaged in the business of transporting for hire, can not by a mere declaration of a statutory enactment be made a common carrier subject to the provisions of the public utilities act. Such a provision would constitute a taking of private property by the State for public use without due process of law.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 68.

REGULATION OF PIPE LINES.

The Constitution of California (sec. 23, Art. XII) provides that every private corporation operating any pipe line within the State for the transportation of crude oil, either directly or indirectly, to or for the public and every common carrier is declared to be a public utility subject to such control and regulation by the Railroad Commission as may be provided by the legislature. But under this provision the State can not subject private property to a public use, nor confer authority on the Railroad Commission to assume control of private pipe lines engaged in the transportation of crude oil. Neither by the declaration of the State Constitution nor by the act of the legislature can private property be taken for public use without just compensation.

Producers' Transportation Co. v. Railroad Commission (California), 169 Pacific 59, p. 60.

Associated Pipe Line Co. v. Railroad Commission (California), 169 Pacific 62, p. 68.

MINING TERMS.

JACK SETTER.

A jack setter is a miner assisting in the operation of a coal-cutting machine, one of whose duties is to see that the roof of the mine at or near where the cutting machine is at work is in a reasonably safe condition.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072.

MINERALS.

The term "minerals" when employed in a conveyance in the State of West Virginia is understood to include every inorganic substance which can be extracted from the earth for profit, whether it be solid, as rock, fire clay, the various metals, and coal, or liquid, such as salt and other mineral waters and petroleum oil and gas.

Horse Creek Land & Mining Co. v. Midkiff (West Virginia), 95 Southeastern 26, p. 27.

"MISFIRE" HOLE.

Where for any cause a charge has failed to explode, the drill hole containing such charge is spoken of as a misfire hole.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147.

SEAM BLAST.

Seam blast is a blast made by placing powder or other explosives along and in a seam or crack between the solid wall and the stone or coal intended to be removed, made or opened by reason of the original shot or blast that was not heavy enough to throw or remove the stone or coal from the solid mass.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 498, p. 495.

SKIPS.

Skips are cars operated from the surface by cables used for hauling ore or for taking miners into and out of the mine.

Moreno v. New Guadalupe Mining Co. (Cal. App.), 170 Pacific 1088.

"SNOW BIRD" MINES OR SHIPPERS.

"Snow bird" mines or shippers is a term applied by railroad managers to team track loading mines that produce only small quantities

of coal and can not operate under normal conditions, but only when coal is high by reason of a scarcity or a shortage of cars for shipment.

Baltimore & Ohio Railroad Co. v. Public Service Commission (West Virginia). 94 Southeastern 545, p. 547.

TOOL NIPPER.

Tool nipper is a term applied to a person whose duty it is to carry powder and sharpen drills and tools used in a mine down to the various levels of the mine and to bring such tools and drills as have been dulled by use to the surface.

Moreno v. New Guadalupe Mining Co. (Cal. App.), 170 Pacific 1088.

MINING CORPORATIONS.

AUTHORITY OF PRESIDENT—SIGNING NOTES—RATIFICATION.

The president of a mining corporation borrowed money and signed notes representing the amount as president of the mining company. The lender requested the board of directors to pay the note. The answer, without any written entry, was that when the mine gets on a productive basis we will try and take care of it and will keep it in mind, so when we get on a productive basis we can look after you if we so choose. This in no sense amounted to a ratification of the act of the former president, nor did it amount to the making of a new contract.

Massie v. Eldorado Gold Star Mining Co. (Cal. App.), 171 Pacific 814, p. 815.

DUTY TO KEEP OFFICE AND BOOKS WITHIN THE STATE.

The statute of California makes it the duty of the secretary of every corporation formed for the purpose of mining or corporations conducting mining operations in California to keep an office within the State and a complete set of books and to publish monthly an itemized statement or balance sheet. This includes mining corporations organized in the State of California for the purpose of conducting mining operations in other States, and such a corporation must keep an office and a complete set of books in the State of California.

Overton v. Noyes (California), 170 Pacific 1110.

ISSUANCE OF STOCK WITHOUT CONSIDERATION.

The issuance of capital stock of a mining corporation without consideration and without payment therefor is a violation of the Constitution (Art. XII, sec. 11) and of the Civil Code (sec. 359), and directors in so doing commit a breach of trust that may be redressed in an action by the stockholders for the benefit of the corporation.

James v. P. B. Steifer Mining Co. (Cal. App.), 171 Pacific 116, p. 119.

LIABILITY OF TRUSTEE FOR ASSESSMENTS.

A person holding stock of a mining corporation as trustee is liable for calls on the subscription contract made as assessments.

La Habra Oil Co. v. Francis (Cal. App.), 169 Pacific 401.

LIABILITY OF STOCKHOLDER—JOINT ACTION BY CREDITORS.

The constitution of South Dakota makes the stockholders of a corporation personally liable for the debts of the corporation to the extent of the amount remaining unpaid upon stock owned by any stockholder. The statute also provides that any creditor of the corporation may institute joint or several actions against any of the stockholders that have not fully paid for the capital stock held by him. But this personal liability of stockholders can not be enforced in a Federal court by a bill in equity against several stockholders jointly, as the South Dakota statute can not enlarge the Federal jurisdiction in equity, and that jurisdiction does not extend to such actions.

Clinton Mining & Mineral Co. v. Cochran, 247 Federal 449, p. 451.

GUARANTORS OF STOCK—LIABILITY.

The promoters of a mining corporation executed an agreement reciting the fact that they were promoting the organization of a corporation for the purpose of mining gold, and agreed when the corporation was organized to deliver to a certain named person a certain amount of the shares of the capital stock for a specified sum. The instrument also covenanted to save the subscriber harmless thereon and to secure the subscriber for his investment, and guaranteed the repayment of the money with interest at 6 per cent per annum, the principal sum to be repaid in three years from the date of the agreement. The capital stock became worthless, the company eventually failed, and the corporation was dissolved. The guaranteed subscriber could have sued the guarantors at law for reimbursement of the amounts paid by him with interest, but he can not maintain a bill in equity to compel specific performance of so much of the agreement as relates to the exercise of a power mentioned or described in the contract of guaranty. If the power promised to be exercised by the agreement had not been exercised pursuant thereto, the only remedy of the guaranteed subscriber would have been an action for damages against the estate of the guarantor.

Vinton v. Pratt (Massachusetts), 117 Northeastern 919, p. 920.

LIABILITY OF STOCKHOLDERS FOR CORPORATE DEBTS—PARTIES.

The statute of South Dakota (sec. 441, Civil Code), makes stockholders of a corporation personally liable for the debts of the corporation to the extent of the amount that is unpaid upon the stock held by any stockholder, and gives any creditor the right to institute actions against one or more stockholders to recover any such unpaid balance. Such an action can be maintained by a creditor against one or more stockholders of a mining corporation to recover an un-

paid balance due on stock subscription without the corporation itself being made a party to the proceedings.

Clinton Mining & Mineral Co. v. Cochran, 247 Federal 449, p. 451.

LIABILITY OF STOCKHOLDER—CONCLUSIVENESS OF JUDGMENT AGAINST CORPORATION.

In an action by a creditor against stockholders of a mining corporation to enforce their statutory liability, the stockholders are concluded on the question of corporate indebtedness by a judgment against the corporation in the absence of fraud.

Greenfield v. Minnesota Mining & Developing Co. (Minnesota), 165 Northwestern 274.

SALE OF STOCK.—FRAUD NOT ESTABLISHED.

By representations that a mining corporation owned mining properties in Mexico that were exceedingly rich and valuable, a person was induced to purchase stock in the mining corporation and executed his notes therefor. Such representations are not sufficient alone to constitute fraud where the mining company did own mines in Mexico, had employed from 15 to 125 men and had in its employ and in actual work at the mine engineers, assistant engineers, and superintendents who were receiving substantial salaries, and it had constructed buildings, installed machinery, had done considerable work in developing the mines, and had spent in the mining operations something like \$60,000 aside from the construction of a road, and many tons of ore has been actually mined ready for transportation, the ore being of a nature to produce minerals in paying quantities, and where, according to the testimony of competent persons, it appeared that the mineral-producing rock that had been actually removed from the place was of the value of several million dollars.

Lealle v. Ebner (Ind. App.), 118 Northeastern 829, p. 830.

RIGHT OF STOCKHOLDER TO SUE ON BEHALF OF CORPORATION.

The fraudulent appropriation of the funds and the spoliation and destruction of the property of a corporation through the agencies of the directors presents an obvious instance for the interposition of equity at the suit of the stockholders who sustain a fiduciary relation to the corporation and whose interests they really represent in the action. Courts of equity may enjoin on the behalf of the stockholders of a corporation any improper alienation or disposition of the corporate property for other than corporate purposes, and will restrain the commission of acts which are contrary to law and tend to the destruction of the franchises as well as the improper management of the

business of the company or a wrongful diversion of its funds. A court of equity as far as it can be done will compel the restitution and restoration of the funds or property of a corporation that have been misappropriated or destroyed by the directors.

James v. P. B. Steifer Mining Co. (Cal. App.), 171 Pacific 116, p. 117.

SUIT BY STOCKHOLDERS—DEMAND ON DIRECTORS EXCUSED.

Stockholders of a mining corporation may maintain a suit against directors guilty of fraudulent conduct without making a demand upon the directors to sue when it appears that it would be futile and useless to make the demand on the corporation or its directors and officers to commence a suit to obtain relief. So a demand is excused where the directors are parties to the suit and claim the right to do what they are charged with having done.

James v. P. B. Steifer Mining Co. (Cal. App.), 171 Pacific 116, p. 120.

JUDGMENT AGAINST CORPORATION—FRAUD IN OBTAINING—PLEADING.

In an action by a creditor of a mining corporation against the stockholders to enforce their liability where a judgment had been rendered against the corporation, a stockholder may defend on the ground of fraud on the part of the plaintiff in procuring the judgment or the cause of action on which the judgment was based. General allegations of fraud in that the plaintiff was the vice president and principal stockholder of the mining corporation and advanced large sums of money, taking its notes at usurious rates and compelling it to turn over large amounts of stock as a consideration for the loan, and averring also that the judgment upon such loan was suffered to be entered by default or through the fraud and collusion of the directors and officers of the corporation with the plaintiff are insufficient as a basis for relief. Mere general allegations of fraud are insufficient and the facts constituting the usury are not specifically stated and the answer is insufficient to present an issue of fraud.

Greenfield v. Minnesota Mining & Development Co. (Minnesota), 165 Northwestern 274, p. 275.

FOREIGN CORPORATION—APPOINTMENT OF PROCESS AGENT.

The statute of Nevada requires every foreign corporation to appoint and keep a State agent upon whom all legal processes may be served and provides that if any such company shall fail to appoint such agent it shall be lawful to serve such company with any and all legal processes by delivering a copy to the secretary of state. These sections fail to provide a means whereby proper notice should be

given to a foreign corporation and do not constitute due process of law.

Wildes v. Lou Dillon Gold Field Mining Co. (Nevada), 170 Pacific 1046.

FOREIGN CORPORATION—AFFIDAVIT FOR PUBLICATION.

The statute of Nevada provides for service on foreign corporations by publication on the filing by the plaintiff of an affidavit showing the defendant to be a nonresident of the State. If the residence of a nonresident is known the court shall also direct a copy of the summons and complaint to be deposited in the postoffice directed to the person or corporation to be served at his place of residence. Nothing less than a strict compliance with the State providing for constructive service will confer jurisdiction. The statute requires that where the residence of a nonresident defendant is known it must be stated and if the residence of a nonresident is unknown to the person making the affidavit, a statement to that effect must be made. It is in the probative facts stated in the affidavit that the order of the court directing service by publication must find justification, and from these, the court must find grounds upon which to conclude that the ultimate facts required by the statute exist.

Wildes v. Lou Dillon Gold Field Mining Co. (Nevada), 170 Pacific 1046, p. 1047.

DISSOLUTION ON VOTE OF STOCKHOLDERS—RIGHT TO DEMAND CERTIFICATE.

The stockholders of the Old Dominion Mining & Smelting Company resolved to terminate its corporate existence by a voluntary dissolution and prior to March 24, 1917, filed with the secretary of state of New Jersey the written consent of the stockholders in accordance with the requirements of the statute and requested that officer to issue to it the formal certificate of its dissolution. The secretary refused to issue the certificate because as claimed by him and as certified by the Comptroller the taxes for the year 1917 were an existing obligation against the corporation and it could not be dissolved without the payment of all existing taxes. Under the statutes of New Jersey providing for the taxation of corporations the yearly period begins on April 18 of each year, and at the time of the filing of the written consent of the stockholders to the dissolution of the corporation the time for assessing and levying the taxes for the year 1917 had not been reached and such taxes were not then an existing lien against the corporation, and the comptroller should have certified to the secretary of state that all taxes levied or assessed against the Old Dominion Mining & Smelting Company had been paid and the secretary of state should have issued the dissolution certificate as requested.

Old Dominion Copper Mining & Smelting Co. v. State Board of Taxes & Assessments (New Jersey), 103 Atlantic 79, p. 80.

DOUBLE TAXATION.

A construction of the statute which would authorize a double taxation of mining corporations is not to be adopted unless it is required by the express terms of the statute or by necessary implication.

Old Dominion Copper Mining & Smelting Co. v. State Board of Taxes and Assessment (New Jersey), 103 Atlantic 79, p. 81.

EXEMPTION FROM ANNUAL LICENSE FEE.

Mining and other corporations are required by the statute of New Jersey (act 1884, P. L. p. 232), to pay an annual tax for the use of the State by way of a license for their corporate franchises. By the same act corporations are required to pay a yearly license fee or tax of one-tenth of 1 per cent on the amount of the capital stock; but mining companies and certain other named companies are expressly excepted from the latter provision.

Old Dominion Copper Mining & Smelting Co. v. State Board of Taxes and Assessment (New Jersey), 103 Atlantic 79, p. 80.

LIABILITY AS ASSIGNEE OF COAL LEASE—ESTOPPEL.

A mining corporation, being a large stockholder in another mining company in order to protect its interests as such stockholder undertook to operate a coal mine and to mine the coal under a lease assigned to the company in which it owned the stock, is estopped from accepting the benefit of the lease and rejecting its burden, and is liable for the payment of the royalties stipulated in the lease.

Bruce Coal Co. v. Bibby (Alabama), 77 Southern 545, p. 547.

USE OF PROPERTY—OPERATION OF OIL WELL.

A railroad company owning the fee of the land used by it as a right of way is not to be enjoined from drilling and operating an oil well on such land, because the statute provides that no corporation shall employ or use its property directly or indirectly for any other purpose whatever than to accomplish the legitimate purpose of its creation or those permitted by law to be applicable.

Chrowell v. Howard (Texas Civil App.), 200 Southwestern 911, p. 912.

KNOWLEDGE OF RULES OF FIRST-CLASS MINING.

A mining corporation organized under the laws of the State of Kansas and carrying on coal-mining operations in that State, leased a tract of land in Missouri adjoining the Kansas State line, and by the terms of the lease bound itself to mine all the minable coal in the

land that could be mined under the rules of first-class mining prevailing in the southern Kansas coal district. In construing the lease a court will presume that the mining company was well acquainted with the nature and conditions of the work it was engaged to perform, the mineral character of the lands upon which it was to be performed, and the rules of first-class mining in the coal district named. Where the nature or substance of these rules is not given a court will presume that they mean good, safe mining with respect to the conservation of the product, the protection of the miners, and the prevention of injury to the surface, as all of these would be implied.

Union Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 234.

TRANSPORTING GAS THROUGH DANGEROUS PIPE—LIABILITY.

A mining company transporting its gas at a high pressure through gas pipes maintained on the surface of the ground and laid along or across a traveled way, may be liable for injuries caused by the breaking of the pipe due to the high pressure of the gas, although the gas pipe was owned and laid by a different corporation.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 34.

MAINTAINING A DANGEROUS GAS MAIN—LIABILITY FOR INJURIES.

A mining corporation laying and maintaining a gas main on the surface of the ground and on and along or across a traveled way may be liable to a person injured by a breaking of the gas main due to the high pressure of the gas, though the gas in the main was owned and transported and used by another and different company.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 34.

MINING PARTNERSHIPS.

CREATION AND EXISTENCE.

Under the statute of California (Civil Code, sec. 2511), a mining partnership exists when two or more persons who own or acquire a mining claim for the purpose of working it and extracting the mineral therefrom and actually engage in working the same, but it is not necessary to the existence of a mining partnership that the property which is to be operated be owned in fee by the partners.

Harper v. Sloane (California), 169 Pacific 1043, p. 1045.

ACTUAL WORKING OF MINE NOT NECESSARY.

It is not essential to a mining partnership that each of the partners shall perform physical work upon the claim. One partner who supplies money to be used in working the mine is engaged in such work as truly as the one who devotes his own labor to the enterprise.

Harper v. Sloane (California), 169 Pacific 1043, p. 1046.

PARTNERSHIP IN PROPERTY TO BE HELD BY EQUITABLE TITLE.

A mining partnership may be created and exist with reference to mining property held by an equitable title as such ownership is a sufficient basis for the existence of a partnership.

Harper v. Sloane (California), 169 Pacific 1043, p. 1046.

RIGHT TO ACCOUNTING.

Where a mining partnership exists under which one of the partners expended money and labor, he is entitled to an accounting in order to settle the relative rights of himself and his copartner. The rule applies although the partnership had been dissolved or abandoned before the commencement of the action for an accounting.

Harper v. Sloane (California), 169 Pacific 1043, p. 1046.

MINING CLAIMS.

MINERAL CHARACTER OF LAND.

FINDING OF LAND DEPARTMENT NOT CONCLUSIVE.

The finding by the officers of the Land Department respecting the mineral character of a tract of land embraced within a mineral entry is not itself final or conclusive but essentially interlocutory. It is only a step in the proceedings looking to the ultimate disposal of the title, and until the issuance of a patent is as much open to reconsideration and reversal as are the interlocutory orders or decrees of a court of equity until the entry of the final decree. The Land Department is authorized at any time before patent to inquire whether the original entry was in conformity with the law.

Kirk v. Olson, 38 Supreme Ct. Rep. 114, p. 115.

PATENT AS AN ADJUDICATION.

A patent duly issued by the Land Department sets at rest for all time the question of the mineral or nonmineral character of the land described.

Thomas v. Horst (Montana), 169 Pacific 731, p. 733.

LOCATION OF CLAIM.

LOCATION ON RAILROAD LANDS—PRIORITY OF RIGHT.

A valid location of a mining claim can not be made upon lands within the limits of the grant to the Northern Pacific Railway Company upon lands that had been classified as nonmineral pursuant to the act of February 26, 1895 (28 Stats. 683).

Thomas v. Horst (Montana), 169 Pacific 731, p. 733.

ASSESSMENT WORK.

DETERMINATION OF VALUE.

The true test for determining the value of assessment work upon a mining claim is the actual value of the improvements to the mine and not the amount of wages paid to workmen performing the work or the amount and cost of material used. Evidence of the cost of labor and material used is competent as tending to show the good faith of the owner making the expenditures; but it is not conclusive upon the value of such improvements.

McKirahan v. Gold King Mining Co. (South Dakota), 165 Northwestern 542, p. 543.

WORK ON ONE CLAIM—EFFECT ON OTHERS.

It does not follow as a matter of law that the assessment work performed on any one mining claim must be equally apportioned to all adjoining claims owned by the same locator or owner. A person owning a number of adjoining claims can do \$100 worth of work on any one claim and hold it and forfeit all the others; or he might do enough work on one claim to hold two claims and forfeit the others, and he might designate the particular claims he intended to hold. In such case the assessment work would hold the claim upon which it was done or any other claims for which it was done, where the particular claim is designated.

McKirahan v. Gold King Mining Co. (South Dakota), 165 Northwestern 542, p. 543.

RESUMPTION OF WORK PREVENTS RELOCATION.

A mining claim is not subject to relocation by a third person on the ground of the failure of the locator to perform the assessment work within the year where the owner had workmen upon the ground performing labor upon the claim before and at the time of the attempted relocation.

McKirahan v. Gold King Mining Co. (South Dakota), 165 Northwestern 542, p. 543.

DEVELOPMENT SHAFT—INSUFFICIENT PROOF—NEW TRIAL.

In a contest between the original locator of a mining claim and a relocater where the only question was as to the sufficiency of the development work and the validity of the relocation, the relocater is not entitled to a new trial on the ground of newly discovered evidence, where such newly discovered evidence consisted merely in measuring the diameter and depth of the development shaft after the trial and the discovery that it was not of the dimensions required by law, where no good or sufficient reason was shown for not making the measurements before the trial.

McKirahan v. Gold King Mining Co. (South Dakota), 165 Northwestern 542, p. 544.

RELOCATION.

PERFORMANCE OF ASSESSMENT WORK—RESUMPTION OF WORK.

A mining claim is not subject to relocation where the owner either had performed the annual assessment work during the year, or where having failed to perform the assessment work during the year the work had been resumed and was in process of performance at the time of the attempted relocation.

McKirahan v. Gold King Mining Co. (South Dakota), 165 Northwestern 542, p. 543.

PATENTS.**PRESUMPTIONS ARISING FROM PATENT.**

The respect due to a patent for public lands, the presumption that all preceding steps required by law were duly observed and the conditions necessary for stability in titles resting upon these instruments, require that in suits to annul patents the Government shall bear the burden of proof and shall sustain it by that class of evidence which commands respect and that amount of it which produces conviction.

United States v. Porter Fuel Co., 247 Federal 769, p. 773.

HOLDER AS TRUSTEE.

Where a patent was issued to one person when in equity and good conscience and under the laws of Congress it should have been issued to another person a court of equity will convert the holder of the legal title into a trustee for the use and benefit of the owner.

Thomas v. Horst (Montana), 169 Pacific 731, p. 732.

AVOIDANCE—SUBSEQUENT DISCOVERY OF MINERALS.

If the applicant's proofs were not false at the time they were presented, they can not be condemned and the good faith of the applicant impuned by any subsequent change in the conditions. There are vast tracts of public land in which minerals of different kinds are found but not in such quantity as to justify expenditure in the effort to extract them, and it is not to such land that the term "mineral" in the sense of the statute is applicable. It is possible that lands settled upon as suitable only for agricultural purposes, entered by the settler and patented by the Government may be found in later years to contain valuable minerals, and this has often happened. If the entryman at the time of the patent proceedings, which resulted in the final entry of the land, did not know or had no good reason to know that the lands in question apparently contained no valuable coal deposits, the patents can not be annulled on the ground of fraud.

United States v. Porter Fuel Co., 247 Federal 769, p. 771.

PLACER CLAIMS.**MINERAL CHARACTER—RIGHT OF CLAIMANTS TO RECONSIDERATION.**

In an application for patent by a placer claimant the claimant is entitled to notice of the intended reconsideration of the part of the officers of the Land Department of the mineral character of the tract of land and to have an opportunity to support the original finding by evidence and otherwise. He is entitled to show that the tract

was valuable for placer mining as originally found by the land officers. But the irregularity in failing to give notice of an intention to reconsider the question of the character of the land was not prejudicial where the evidence established the fact that the land was strictly agricultural and not subject to entry or acquisition under the placer mining law.

Kirk v. Olson, 38 Supreme Ct. Rep. 114, p. 115.

ADVERSE CLAIM.

RIGHT OF PARTY TO ADVERSE—PLEADING.

On an application for a patent for a mining claim by an alleged owner, a third person filed an adverse claim and thereupon instituted an action to enforce the same. The complaint in the action averred that the complainant at one time was the owner of the mining claim, or had some interest therein, but averred that prior to the institution of the suit he had conveyed all such rights to a certain corporation in consideration of the execution to him of certain shares of its capital stock now owned by him. The pleading by its averments shows that the complainant had conveyed his interest or title in the mine to a corporation but failed to aver or show any right why he as an individual should file an adverse claim and bring action thereon for and on behalf of the corporation. The complaint for these reasons failed to state a cause of action.

Wesseler v. Brankman (Colorado), 170 Pacific 189.

SALE AND TRANSFER.

AGREEMENT TO DEVELOP—CONSIDERATION FOR CONVEYANCE—PAROL PROOF OF INTENTION.

The owner of mineral lands and a mining claim by deed duly executed and in ordinary form conveyed the same to his nephew. At the time of the conveyance the grantor and grantee entered into a written agreement by which the grantee undertook the opening up and developing of the property as a mining claim at his own expense. The agreement contained a clause to the effect that the intention of the parties was to give the full and entire benefit of the property to the grantee, with the right to proceed with the opening up and development thereof and to obtain the full benefit to be derived therefrom except that the grantor was to have care and maintenance during his lifetime. The deed was in no wise ambiguous or equivocal, but its language was clear and plain and its meaning was a matter of pure legal interpretation. The declaration of intention incorporated into the agreement constituted a "term" of the contract under the terms of the deed and the express declaration of the agree-

ment itself. Parol evidence was not admissible to show the intention of the grantor and to prove that the conveyance was made on a condition subsequent.

White v. Hendley (Cal. App.), 169 Pacific 710, p. 713.

AGREEMENT TO TRANSFER—EFFECT ON TITLE.

A written agreement between the owner of an undivided interest in a mining claim and a prospective purchaser by which the owner agreed to transfer his interest to the purchaser on the payment of a stated sum, does not of itself deprive the owner of his interest in the claim.

Mohr v. North Rawhide Development & Mining Co. (California), 170 Pacific 600.

STATUTES RELATING TO MINING OPERATIONS.

CONSTRUCTION, VALIDITY, AND EFFECT.

APPLICATION TO MINE OPERATOR.

Subsection (c) of section 29 of the Illinois mining act, (Hurd Rev. Stats., 1915-16, ch. 93), applies only to a mine operator who is an employer. Some of the provisions of the act apply to miners, others to the operator or owner of the land, or some may be applicable to all persons, but subsection (c) of section 29 applies only to the operator, and under this subsection a mine foreman can not be joined as a co-defendant with the mine operator and held liable for damages for injuries to a miner caused by an explosion of powder at the face of the coal where the miner was working.

Wendzinski v. Madison Coal Co. (Illinois), 118 *Northeastern* 435, p. 437.

REGULATIONS FOR TRANSPORTATION OF COAL.

The Public Service Commission of West Virginia permits just discrimination in the matter of furnishing cars for the transportation of coal, but the Public Service Commission is authorized to change only unjust, unreasonable, insufficient and unjustly discriminatory "regulations, measurements, practices, acts, or service." The amendatory act (Code 1916, ch. 150), does not clothe the commission with unlimited power over the subject of classification.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 *Southeastern* 545, p. 547.

DUTIES IMPOSED ON OPERATOR.

DUTY TO FURNISH PROPS.

The statute of Arkansas (sec. 5352, Kirby's Digest) requires the owner, agent, or operator of any mine to keep a sufficient amount of timber to be used when required as props so that miners can properly secure their working places in the mine. Where the failure to furnish props had nothing to do with the injury and the result would have been the same if props had been furnished the mine operator may not be held liable.

Western Coal & Mining Co. v. Watts (Arkansas), 199 *Southwestern* 921, p. 922.

DUTY OF PROPPING.

As a miner in his mining operations passes on in his work and the mine operator assumes to occupy the room with tracks, cars, and

mules, the duty to support the roof back of the working place rests upon the mine operator. It is then no longer the working place of the miner in the sense that these terms are used in the Iowa statute. Although the roof may be properly secured at the time the work is in progress it may become defective and unsafe and the props that made it safe for the miner may no longer make it safe for those who use or traverse the room, therefore it is made the duty of the mine operator, through his foreman or pit boss, to inspect the roof and see that it is kept in a reasonably safe condition.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

DUTY TO WARN OR INSTRUCT.

The statute of Illinois (Hurd Rev. Stats. 1915-16, ch. 93, sec. 20, clause (a), paragraph 14) requires a mine operator to instruct an employee as to the proper method of handling explosives and a mine operator is not relieved of this statutory duty simply on the ground that the Board of Mine Examiners has granted a certificate of competency and qualification to a person to be employed as a miner.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 436.

INSPECTION—DUTY OF MINE FOREMAN.

The statute of Iowa (workmen's compensation act, sec. 2489-13a, supp. Code 1913) makes it the duty of a mine foreman or pit boss in charge of any mine to make careful inspection of the mine from day to day. In an action by an injured miner for damages caused by a fall of slate from the roof of an entry it is proper to show that the roof of the entry at places other than where the miner worked were loose and drummy and that the mine forman was negligent in not making the required inspection, and for which negligence the mine operator must respond in damages.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 394.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

DUTY TO CONSTRUCT TRAVELING WAY AROUND SHAFT—CROSSING BOTTOM OF SHAFT.

The statute of Iowa (sec. 2486j, Code Supp. 1913) requires that mine owners and operators shall construct at the bottom of each hoisting shaft a safe and convenient traveling way around the shaft for employees and animals; and the statute makes it unlawful for any person to pass across the shaft bottom in any other manner than by the traveling way contemplated. The statute excepts such em-

ployees as may be necessary to perform the work at the bottom of the shaft or those engaged in making repairs. The bottom intended within the meaning of this exception is that lowest down beneath the cage; and the exception can not apply to a miner or an employee who is neither engaged in making repairs nor employed to perform work at the bottom of the shaft. A miner employed and stationed in an entry near the bottom of the shaft to direct the loading and unloading of cars and to detach the trips from a cable is not within the class excepted from the operation of the statute. The design of the lawmakers was to prevent injuries from the operation of the cages in the shafts and this is sought to be accomplished by providing a way around the bottom of the shaft; and as such other way was thereby provided, persons are prohibited from crossing the shaft at the bottom. The particular danger to be obviated is that from a descending cage as its descent can not be well known until near and therefore the only safety is in not exposing a person beneath it.

Dennis v. Gibson (Iowa), 165 Northwestern 1080, p. 1082.

WILLFUL VIOLATION—MEANING—QUESTION OF FACT.

The courts, in order to give effect to the purpose of the Illinois mining statute (Hurd Rev. Stats., 1915-16, ch. 98), have given the word "willful" a meaning of a merely conscious failure to do some act without any wrongful or evil intent. The question whether a place is dangerous and ought to be marked is to be submitted to a jury and the judgment of the mine manager on that question goes for naught.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 438.

VIOLATION BY OPERATOR.

WANT OF KNOWLEDGE—BURDEN OF PROOF.

The employer's liability act of Indiana places the burden upon the mine operator of proving that he did not know of a defect in the working place, tool, implement, or appliance, or that he was not chargeable with knowledge thereof in time to have repaired the same or to have discontinued the use of such working place, tool, implement, or appliance. But the statute expressly provides that such proof of want of knowledge may be made under the general denial.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 924.

FAILURE TO INSPECT MINER'S WORKING PLACE.

Under the mining act of Oklahoma (Rev. Laws 1910, sec. 3988), the mine foreman is required to inspect the working places of the miners, and the failure of the foreman to inspect a miner's working

place for unexploded charges of dynamite and the negligence of the foreman in directing and permitting a miner to work near an unexploded charge of dynamite, thereby exploding the charge and injuring the miner, must be regarded as the proximate cause of the miner's injury.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 50.

PLEADING—INSUFFICIENT CHARGE OF VIOLATION—USE OF SAFETY LAMP.

A complaint in an action by an administrator for the death of a coal miner under the statute of Alabama (act 1911, p. 518, sec. 50), where it charges only that the defendant intrusted a safety lamp to the intestate knowing that he was inexperienced or incompetent is insufficient. Under the statute providing that such a lamp shall not be intrusted to any person "until he has given satisfactory evidence to the mine foreman that he understands the proper use thereof and danger of tampering with the same," the fact that the intestate was not experienced and that the foreman knew that he was not, but intrusted him with the lamp, does not necessarily violate the statute. He may have been inexperienced and yet may have furnished satisfactory evidence to the mine foreman that he understood the use of the same. The mine foreman may have undertaken to instruct him and the intestate may have demonstrated that he had learned and understood the use of the lamp, although he had had no previous experience in handling one. If such a lamp could only be intrusted to those of experience, then no new man could be given one or trained or taught to use such a lamp. This section of the statute means that the foreman must ascertain before giving a person such a lamp that he understands the use of the same, whether from past experience or by demonstration and answers after the same is fully explained to him.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 550.

COMPETENCY OF MINER TO USE SAFETY LAMP—PROOF.

The statute of Alabama (acts 1911, p. 518) provides that safety lamps shall not be intrusted to a person until he has given satisfactory evidence to the mine foreman that he understands the proper use of such lamp. In an action for the death of a miner caused by an explosion of gas while using a safety lamp, it is not sufficient and not proper to prove that the intestate understood the proper use of the lamp by a witness stating that he was satisfied from the examination that the intestate knew how to use a safety lamp. This is but the bare conclusion of a witness and does not determine the existence or nonexistence of a material fact in the case. The statute provides

that satisfactory evidence must be furnished the mine foreman, but does not make him the sole arbiter of the fact, but it means such evidence as would reasonably satisfy an ordinarily prudent and careful foreman that the miner understood the proper use of such a lamp, and as to whether or not the evidence was sufficient to satisfy a foreman is a question for the jury.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 551.

NEGLIGENCE PER SE.

Where a mine operator fails to heed a legislative demand to which he is bound to conform he is negligent per se, and if a miner is injured as a result of such failure, however apparent, the latter's right to a recovery shall not be denied as a matter of law solely through a plea that the miner assumed the risk of injury or was negligent in continuing the employment.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 923.

WILLFUL FAILURE TO PERFORM DUTY—LIABILITY.

Subsection (a) of section 29 of the Illinois mining act (Hurd Rev. Stats. 1915-16, ch. 93), makes the wilful failure to do the things required by the act a misdemeanor, which is a violation of public law and an offense against the public. Every person required to do any act is included and the penalty for the misdemeanor is intended to secure the public right. A mine manager or foreman, as well as an employer, may be guilty of a misdemeanor in the violation of this statute and punished accordingly. Subsection (c) under which civil cases are brought does not declare that a cause of action shall arise against any person or persons required to do any of the things enjoined by the act to be done, but simply declares that a right of action shall accrue to any person whose injury is occasioned by the wilful violation of the act or wilful failure to comply with any of its provisions. It is simply declaratory of a right to a civil action and the change in the language is warrant for saying that the general assembly did not intend any such unjust result as a recovery against a mine manager by virtue of this subsection. An employer engaged in the business of mining coal may justly be held liable in a civil action for a failure of duty. He can insure against liability, count such insurance as an expense of his business, and regulate his business accordingly; but to say that an employee working for wages would have to imperil the earnings of a life time, on account of an error of judgment, would be manifestly unjust. The statute was not intended to create a civil liability against a mine manager or mine foreman for a violation of any of its provisions.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 438.

SAFE WORKING PLACE.**DUTY OF OPERATOR—NOTICE OF DANGEROUS CONDITION IN THE ROOF.**

In an action under the Iowa workmen's compensation act by a miner for damages for injuries received by a fall of slate from the roof of an entry, it is proper to prove that the roof of the entry at other places than where the miner worked was loose and drummy, not as a matter of substantive negligence but as notice to the mine operator of conditions existing that call for the exercise of care on the part of the operator to guard against injury from the existence of such conditions, and the care must be commensurate with the dangers apparent.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 394.

See *Erickson v. Maple Block Coal Co. (Iowa)*, 167 Northwestern 105, p. 107.

LIABILITY FOR FAILURE TO PROVIDE SAFE PLACE—PRESUMPTION AND BURDEN OF PROOF.

When a miner engages in the employment of a mine operator the duty arises on the part of the employer to see that the place in which the miner was called upon to discharge his duties to the employer was reasonably safe, and when injured by the fall of slate, the resulting injury makes a prima facie case that the employer had not discharged his duty and the burden is then upon the employer to show that the place was in fact reasonably safe in order to escape liability. A showing that the place was not reasonably safe met by a counter showing that the employee himself was negligent and that his negligence contributed to the injury does not meet the requirements of the law and exonerate the employer. Such showing may affect the amount of recovery but it is no defense. To escape liability the employer must show that he was not negligent in respect to this matter, or that his negligence did not cause the injury, or that the injury was due to some willful misconduct on the part of the employee or was the result of his intoxication.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 392.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

RELATIVE DUTY OF OPERATOR AND MINER—MINER'S WORKING PLACE.

The Iowa statute does not itself fix, and from the statute itself it can not be determined where the working place of a miner is; but presumably it is where he is working and in the room in which he is engaged in mining coal. The statute imposes the duty upon the mine foreman to make careful inspection of the mine; to see that the mine is supplied with props; and it is made the duty of each miner to examine his working place. It is the duty of the mine foreman to

make such reasonable inspection as is reasonably necessary to ascertain the true condition generally of the mine and of the room in which a miner is working. The miner's working place does not include the roadway in his room where the miner's operations have advanced and tracks have been laid. But where a miner called the mine foreman's attention to the dangerous condition of the roof of his room over the roadway and requested that it be made secure and on the failure of the foreman to secure the place, the miner for his own protection may prop or otherwise secure the dangerous roof over the roadway, and if injured or killed while engaged in so doing the mine operator is liable, where the operator has rejected the provisions of the workmen's compensation act.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 395.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

SAFE APPLIANCES.

FAILURE TO SUPPLY SAFE APPLIANCE.

A mine operator may be liable for injuries to a miner operating a drill by compressed air because of the failure to furnish a suitable and proper valve on the line of pipe supplying the compressed air to the machine operated by the injured miner and where by reason of the failure to supply the pipe with a proper valve the entire force of compressed air in the main line was turned into the branch operating the miner's machine, thereby causing the injuries complained of.

Loveless v. Cunard Mining Co. (Mo. App.), 201 Southwestern 375, p. 379.

DUTIES IMPOSED ON MINER.

MINER'S DUTY TO PROP WORKING PLACE.

The statute of Iowa (sec. 2489-16a, Code Supp. 1913) makes it the duty of each miner to examine his working place and not to commence work until it is made safe. It requires that he shall securely prop and timber the roof of his working place. This duty of the miner to examine his working place and to prop and timber the roof is limited to the miner's working place and does not necessarily include the whole room. The miner's working place is the place where he is engaged in his work, and while so engaged it is his duty to timber and make safe the place where he is working.

Erickson v. Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

DUTY TO INSPECT ROOF AFTER BLAST.

The statute of Kentucky (sec. 2738b) authorizes a mine operator to make and post rules for the government and protection of the

miners. A rule adopted and posted pursuant to the statute made it the duty of a miner to inspect the roof after each blast as the work progressed and to cease working and leave the place and report to the mine foreman, or his assistant, whenever the room became unsafe. A miner violating this rule and failing to inspect the roof of his working place after a blast, and remaining in a dangerous place, can not recover of the mine operator for a consequent injury.

Elk Horn Mining Corp. v. Vahoose (Kentucky), 200 Southwestern 921, p. 923.

DUTY TO PROP WORKING PLACE.

The statute of Arkansas (sec. 5352, Kirby's Digest) makes it the duty of a mine operator to furnish props and also makes it the duty of the miner to prop or otherwise make safe his working place. It is the duty of the miner under the statute to request props when needed. In an action by a miner for injuries caused by a fall of rock from the roof on the ground that the operator failed to furnish props when required, the mine operator can not escape liability on the ground that the miner did not want or need the props for the reason that he attempted to take down or remove the rock that appeared dangerous, and after some efforts decided that the rock was not dangerous and continued working until injured and that the injury was the result of the miner's mistaken judgment and not from the failure of the operator to furnish props.

Western Coal & Mining Co. v. Watts (Arkansas), 199 Southwestern 921, p. 923.

FAILURE TO EXERCISE CARE—DEFENSE.

The Indiana employer's liability act does not restrict the defense that the conduct of a miner under the circumstances which resulted in his injury was not consistent with reasonable care for his own safety.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 926.

VIOLATION BY MINER.

VIOLATION BY MINE MANAGER—LIABILITY FOR DAMAGES.

The mines and mining act of Illinois (Hurd Rev. Stats. 1915-16, ch. 93), makes the willful failure to comply with the provisions of the act under certain circumstances a misdemeanor and punishable accordingly. The act imposed upon the mine operator certain duties and gives a right of action to any one injured by reason of the failure of the operator to perform the duties imposed. The statute also in terms provides that in case of the enactment of a workmen's compensation act its provisions, if accepted, by the employer, shall be in lieu

of a right of action for damages. This, as well as other provisions, clearly indicates that the right given for civil actions for damages was limited to the mine operator and accordingly an injured miner can not maintain a joint action against a mine operator and a mine manager for damages for injuries occasioned by either a violation of the statute or a failure to comply with some of its provisions.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 438.

RIGHT TO RECOVER FOR INJURY.

The mere fact that a person is violating a penal statute when he receives an injury caused by the negligence of another will not of itself bar a recovery, but whether such fact will have that effect depends on the relation between the alleged violation and the injury. If the unlawful act was a contributing cause of the injury then it will bar a recovery, but if it is merely a condition or an attendant circumstance it will not defeat an action. On this theory a boy 14 years of age injured while employed in a mine will not be denied a recovery because the employment of a boy of that age was a violation of the statute.

Vandalla Coal Co. v. Butler (Ind. App.), 119 Northeastern 34, p. 39.

CUSTOM NOT SUFFICIENT EXCUSE.

The Statute of Iowa (Code Supp. 1913, sec. 2486j), expressly prohibits a miner in a mine from crossing the bottom of a shaft. Proof of a custom in a particular mine to the effect that under certain circumstances and under a certain method of operating the cages the miner in control of the cars was in the habit of crossing the shaft is not a sufficient excuse for the violation of the plain provisions of the statute.

Dennis v. Gibson (Iowa), 165 Northwestern 1030, p. 1031.

EMERGENCY NOT A SUFFICIENT EXCUSE.

The statute of Iowa (Code Supp. 1913, sec. 2486j), expressly prohibits certain employees from crossing the bottom of a shaft in a coal mine. A miner was employed to remove empty cars and those loaded with supplies from the cages at the bottom of the shaft and to put loaded cars onto the cages and to oversee the loading and unloading of miners. It was also his duty to jerk a rope and disconnect the trip cars from a cable and to kick a latch, thereby switching cars toward the cage on which to be loaded. It was necessary to jerk the rope promptly to prevent cars from piling up on the incline toward the bottom of the shaft. The miner thus employed and while on the opposite side of the shaft noticed a trip coming in on the cable and believing that an emergency existed for the jerking of the rope and

the kicking of the latch to prevent the cars from piling up, attempted to cross the bottom of the shaft, and while doing so was struck and injured by a descending cage. The supposed emergency requiring the prompt action was not a sufficient excuse and did not justify the miner in violating the plain provisions of the statute, and the violation of the statute was sufficient to prevent a recovery for the injuries so received.

Dennis v. Gibson (Iowa), 165 Northwestern 1030, p. 1031.

MINER'S WORKING PLACE.

DUTY OF MINERS TO MAKE PLACE SAFE.

The statute of Iowa (workmen's compensation act, sec. 2489-16a), makes it the duty of each miner to examine his working place upon entering the same and prohibits him from beginning work until the place is safe. He is required to prop and timber securely the roof of his working place and to obey any order given by the mine foreman. A miner's working place does not include the part of his room that has been worked out by him and where the track has been laid for the purpose of running cars for loading and removing coal from his room. If the roof becomes dangerous at a place over the roadway or tracks and the mine foreman fails on request of the miner to make the dangerous place safe, the miner may for his own protection make the dangerous place safe and if in undertaking to do so he is injured or killed the mine operator may be held liable.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 395.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

KNOWLEDGE OF DANGER—EFFECT ON EXERCISE OF CARE.

The knowledge or opportunity for knowledge on the part of a miner of a hazard or danger inherent in the employment is of importance under the Indiana employer's liability act only as it affects the issue of his care and conduct under the circumstances.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 926.

NEGLIGENCE OF MINE SUPERINTENDENT OR FOREMAN.

DUTY OF INSPECTION—EXTENT AND LIABILITY.

The statute of Kentucky makes it the duty of a mine foreman to visit all working places in a mine at least twice a week. Notwithstanding these statutory requirements it would be impossible for a mine foreman to watch the progress of each miner's work for dangers that might develop in the progress of the work; and notwithstanding the provisions of the statute this particular duty is not imposed upon the mine foreman.

Elk Horn Mining Corp. v. Vahoose (Kentucky), 200 Southwestern 921, p. 922.

tain persons whose employment may require the crossing of a shaft. A miner or an employe not included in the exception who attempted to cross the bottom of a shaft in violation of the statute and was injured by a descending cage is guilty of such contributory negligence as will defeat a recovery for his injuries.

Dennis v. Gibson (Iowa), 165 Northwestern 1030, p. 1032.

RECOVERY NOTWITHSTANDING CONTRIBUTORY NEGLIGENCE.

Under the Iowa workmen's compensation act contributory negligence of an injured miner will not defeat his right to recover. In any event if the negligence of the mine operator is a contributing cause to the injury, liability attaches.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 395.

EXERCISE OF CARE—QUESTION OF FACT.

The employer's liability act of Indiana declares that the fact alone that the employee took chances in encountering any of the dangers enumerated and whether his act in so doing is denominated contributory negligence or assumption of risk, shall not constitute a defense in an action to recover for resulting injuries if it further appears that he used due care for his own safety. In this sense the term "contributory negligence" is used in the statute. Thus the question as to whether the conduct of a miner while encountering a hazard which the statute says he does not assume was characterized by due care still remains an issue that is to be determined in each instance as a question of fact.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 925.

EFFECT ON ASSUMPTION OF RISK.

DEFENSE ABROGATED.

Where the proximate cause of injuries to a miner was the failure of the mine operator to furnish props, the mine operator can not, in an action by the miner for damages for injuries caused by a fall of rock from the roof, invoke the defense of assumption of risk.

Western Coal & Mining Co. v. Watts (Arkansas), 199 Southwestern 921, p. 923.

Under the employer's liability act of Indiana the defense that inherent or apparent dangers and hazards contributed to the injury complained of is expressly abrogated in all cases where such injury is the proximate result of negligence on the part of the employer.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 925.

NEGLIGENCE OF EMPLOYER—DEFENSE ABROGATED.

The Indiana employer's liability act of 1913 in all actions to which it is applicable abrogates under all circumstances the defense that an injured employee assumed the risk of the hazards or dangers which caused his injury, provided such danger or hazard was the result of negligence on the part of the employer or his agent, servant, officer, or other employee.

J. Woolley Coal Co. v. Tevault (Indiana), 118 *Northeastern* 921, p. 926.

DEFENSE RESTRICTED.

It was clearly the legislative intent in enacting the employer's liability act of Indiana greatly to restrict the defense of assumed risks in personal injury actions between an employer and employee in all industries to which the act is applicable.

J. Woolley Coal Co. v. Tevault (Indiana), 118 *Northeastern* 921, p. 924.

RISKS TRACEABLE TO EMPLOYER'S NEGLIGENCE.

An employee in the course of his employment assumes no risk incident to the business, where the risk can be traceable to the employer's negligence.

Mitchell v. Swanwood Coal Co. (Iowa), 166 *Northwestern* 391, p. 393.

OPERATOR WITHOUT NEGLIGENCE.

Where a risk which resulted in an injury to a miner contains no negligence on the part of the mine operator, such risk is assumed by the miner.

J. Woolley Coal Co. v. Tevault (Indiana), 118 *Northeastern* 921, p. 926.

VIOLATION OF STATUTE MADE FOR SAFETY OF EMPLOYEES.

The statute of Arkansas (acts 1913, act 175), expressly provides that where the violation of any statute enacted for the safety of employes contributes to the injury or death of an employee, the employer can not invoke the defense of assumption of risk.

Western Coal & Mining Co. v. Watts (Arkansas), 199 *Southwestern* 921, p. 923.

FAILURE TO VENTILATE—ASSUMPTION OF RISK NOT APPLICABLE.

The statute of Oklahoma requires a coal-mine operator to use ordinary care to keep a sufficient current of air at the face of a miner's working place to dilute and render harmless the dangerous and explosive gases. In an action by a miner for damages for injuries

caused by a breach of this statutory duty, the doctrine of assumption of risk is not applicable to the theory of the miner's cause.

Rock Island Coal Mining Co. v. Toleikis (Oklahoma), 171 Pacific 17, p. 19.

CONTINUING TO WORK WITH KNOWLEDGE OF NEGLIGENCE.

Under the workmen's compensation act of Iowa a miner assumes no risk that arises out of or that can be traced to the negligence of the mine operator although continuing to work with knowledge of the negligence and without complaint or promise to repair.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 395.

KNOWLEDGE OF DANGER—CONTINUING TO WORK WITHOUT PROMISE OF REPAIR.

The rule that where a miner knows of the mine operator's negligence and continues working in a place that he knows or should know imperils his safety and does this without complaint and without promise of repair, he assumes the added risk incident to the negligence of the operator and waives his negligence, no longer applies as this rule has been abolished by the Iowa workmen's compensation act where the mine operator elects to reject the provisions of the act.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 396.

EXERCISE OF CARE—NEGLIGENCE OF OPERATOR.

The employer's liability act of Indiana provides that no injured employee whose own conduct at the time is characterized by due care shall be denied a recovery under the statute because of assumed risk if it appears that negligence on the part of the mine operator in any of the particulars enumerated therein caused such risks and proximately contributed to his injury.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 925.

NEGLIGENCE OF FELLOW SERVANT—RISK NOT ASSUMED.

Section 1 of the employer's liability act of Indiana (acts 1911, sec. 8020a, Burns, 1914), abrogates the common-law rule of assumed risks in so far as it applies to the particular risk of injury through the negligence of a fellow servant; and the failure of a fellow servant to exercise reasonable care for the safety of a co-worker engaged in a common employment is now deemed to be a breach of duty on the part of the mine operator and is governed by the rules of law applicable thereto.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 923.

CUSTOM.**EFFECT ON STATUTORY REGULATION.**

The custom and practice of a mine operator or of the mine operators generally throughout a given mining district, to the effect that at no time were practical miners instructed in reference to the manner in which a miner should place, load, drill, tamp, and fire shots at his working place in a mine, and to the effect that a certified miner was not instructed how to place his shots, drill his holes, make his cartridges, tamp the cartridges, place the fuse or squib and light and fire the same, although universal and well known, could not affect the positive provisions of the statute or relieve a coal-mine operator of a statutory duty.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 437.

EMPLOYER'S LIABILITY ACT.**CONSTITUTIONALITY.**

The employer's liability act of Indiana (acts 1911, chap. 88), is constitutional in all its provisions.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 922.

CONSTRUCTION AND APPLICATION.

The phrase "dangers or hazards inherent or apparent," as used in section 2 of the Indiana employer's liability act and the reference to defects in "working places, tools, implements or appliances," in section 3 are synonymous in their practical interpretation.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 925.

CONSTRUCTION—QUESTIONS OF FACT.

Under the Indiana employer's liability act of 1911 all questions of negligence, contributory negligence, and assumption of risk are to be determined by the jury as issues of fact.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 928.

PENNSYLVANIA EMPLOYER'S LIABILITY ACT—CONSTRUCTION.

Neither the employer's liability act nor the mining statutes of Pennsylvania make the employer or mine owner an insurer of the safety of the mine. In an action by an injured miner under the employer's liability act the plaintiff must prove affirmatively as a prerequisite for recovery that the mine operator had been guilty of some actionable negligence.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 434.

ACTION BY INJURED MINER—RIGHT OF RECOVERY.

A miner employed as a helper to the operator of a machine used in cutting under the coal, and whose work required him to kneel near the face of the coal and shovel back the slack and coal cut away by the machine, and who was injured while in this position by a fall of coal from the face of the vein, can not recover where the jury finds either: (1) that his conduct under the circumstances was not characterized by due care for his own safety, in which case he was guilty of contributory negligence; or (2) that the danger or hazard which caused the injury was not known and could not have been known to the mine operator in time to have remedied the condition, or was necessarily incidental to the employment, as in such case the mine operator was not negligent and the miner assumed the risk of injury from such danger or hazard by continuing at his work.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 926.

DEATH OF MINER—LIABILITY—PLEADING.

A complaint in an action under the Alabama employer's liability act (sec. 3910, subdivision 3, Code 1907), was sufficient where it charged that the defendant was operating a coal mine; that the plaintiff's intestate was in the employment of the defendant as a brusher; that while so employed in defendant's mine the intestate was injured and killed by an explosion in the mine; that the intestate's death was the proximate consequence of and was caused by reason of the negligence of a person in defendant's employment to whose orders the intestate was bound to conform, and that such person negligently ordered the intestate to examine a portion of the mine for gas or brush out the gas from a portion of the mine, and that while so engaged the plaintiff's intestate was injured and killed by an explosion of gas.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 550.

PLEADING—SUFFICIENT STATEMENT OF FACTS.

A complaint by a miner for injuries sustained while in the course of his employment in a mine was drawn under the Indiana employer's liability act of 1911, and proceeded on the theory that the complainant received his alleged injuries by reason of the negligence of a fellow servant in the employ of the mine operator. As the complaint contained facts sufficient to constitute a cause of action on the theory on which it proceeded independent of any matters properly denominated as conclusions, there was no available error in overruling a motion to strike out the statements denominated as conclusions.

Vandalla Coal Co. v. Butler (Ind. App.), 119 Northeastern 34, p. 36.

NO LIABILITY WITHOUT NEGLIGENCE.

The employer's liability act of Indiana (acts 1911, chap. 88) does not purport to authorize a recovery for injuries sustained by a miner without negligence on the part of the mine operator or those for whose acts he is responsible, and such negligence still remains the essence of liability in all actions brought under the provisions of the act.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 922.

INJURY AS PROXIMATE RESULT OF EMPLOYMENT—ASSUMPTION OF RISK.

Where an injury complained of by a miner is the proximate result of a danger or hazard necessarily incident to a particular employment, and which may not be obviated by the mine operator in the exercise of ordinary care for the safety of the miners, the risk of injury from such danger or hazard is assumed by the miner as an element in his contract of employment.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 926.

EMPLOYER'S WANT OF KNOWLEDGE OF DANGER—EMPLOYEE'S ASSUMPTION OF RISK.

Where it appears that a defect in the place of work or in the tool, implement, or appliance furnished to an employee by his employer, and which caused the employee's injury, was not known to the employer and could not have been known to him in the exercise of ordinary care in time to have removed the condition, the employee is held to have assumed the risk of injury.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 926.

LIABILITY OF EMPLOYER—SUPERINTENDENCE DELEGATED.

Subdivisions 1 and 2 of section 3910 of the Alabama employer's liability act (Code, 1907) provides that when a personal injury is received by an employee the employer is liable to the injured employee as if he were a stranger if the injury is caused by any defects in the conditions of the ways, works, or plant connected with or used in the business of the employer, or when the injury is caused by reason of the negligence of any person in the service or employment of the employer who has superintendence intrusted to him while in the exercise of such superintendence. An employee in a mine injured by reason of a defective appliance or defective machinery while at work in a place he was directed to work by the superintendent is within both subdivisions 1 and 2 of section 3910 because of the injury resulting from defective machinery and because he was directed to work at the place by the mine superintendent.

Sloss-Sheffield Steel & Iron Co. v. Russell, 247 Federal 289, p. 291.

INDUSTRIAL INSURANCE LAW.**NATURE AND CONSTRUCTION OF WASHINGTON'S INDUSTRIAL INSURANCE LAW.**

The industrial insurance law of Washington is not an employer's liability act. It is not even an ordinary compensation act, but an industrial insurance statute. Its administrative body is entitled the "Industrial Insurance Commission." All the features of an insurance act are present. Not only are all remedies between master and servant abolished and all phases of them withdrawn from private controversy, but an employee is no longer to look to the employer even for the scheduled and mandatory compensation.

Ellamar Mining Co. v. Possus, 247 Federal 420, p. 422.

See *Stertz v. Industrial Insurance Commission*, 91 Washington 588; 178 Pacific 256.

WASHINGTON'S INDUSTRIAL INSURANCE LAW—CONSTRUCTION AND PURPOSE.

The purpose of the industrial insurance law of Washington (3 Rem. & Ball. Code, sec. 6604, seq.) was to remove from the courts personal injury actions by employees and was intended to cover not only injuries but aggravations through negligence of a physician engaged by masters and paid out of sums deducted from the wages of the employees. The intention of this law was to withdraw from private controversy all phases of civil causes for personal injuries to employees and to abolish the jurisdiction of courts over such cases. The purpose of the act was to end all litigation growing out of, incident to, or resulting from the primary injury, and in lieu thereof to give the workmen one recovery in the way of certain compensation and to make the charge upon the contributing industries alone.

Ellamar Mining Co. v. Possus, 247 Federal 420, p. 421.

See *Ross v. Erickson Construction Co.*, 89 Washington 634, 155 Pacific 153.

WORKMEN'S COMPENSATION ACT.**ALASKAN WORKMEN'S COMPENSATION ACT—CONSTRUCTION.**

The essential features of the workmen's compensation act of Alaska are the limitations of its provisions to cases of death or injury to employees "in the mining industry of the Territory," the limitations and specifications of the amounts recoverable in cases of death or injury and the specified liabilities and the joinder in one action of all claimants injured in the same cause. It provides for a trial to be maintained and determined in and by the courts of the Territory and to be governed by the law of procedure applicable to other actions for

the recovery of money. The judgment when rendered creates a personal liability against the employer and not against a fund created by contributions from or assessments against other employers.

Ellamar Mining Co. v. Possus, 247 Federal 420, p. 422.

CONSTRUCTION—ANNUAL EARNINGS—MEANING.

In the construction of the Iowa workmen's compensation act (code Supp. 1918, sec. 2477m9, et. seq.) a court will not strain the enactment into an utter absurdity, but instead it must aim to give every word enacted force and effect, if that may in reason be done. This may be done in reference to this act by assuming that the legislature knew annual earnings from the same employer for the year next preceding an injury were always determinable, and that it directed some computations to be made on a basis other than treating annual earnings as 300 times the average daily earnings, and knowing that annual earnings were always ascertainable and that different standards of computation were provided for, the intention was that 300 times the average daily earnings should be treated as the annual earnings unless the statute provided a different basis for determining annual or other earnings.

Richard v. Central Iowa Fuel Co. (Iowa), 166 Northwestern 1059, p. 1060.

SECTIONS OF IOWA ACT CONSTRUED TOGETHER—BASIS FOR ANNUAL EARNINGS.

In construing the workmen's compensation act of Iowa section 2477m15 must be taken into consideration in construing subdivision i of section 2477m9, in ascertaining the annual earnings. Paragraph (f) of section 2477m15 provides as to employees in employments in which it is a custom to operate for a part of the whole number of working days in each year such number shall be used instead of 300 as a basis for computing the annual earnings. Where there is proof that the mines in which the injured applicant worked were operated 220 days in the year, the computation must be worked out by creating a dividend out of multiplying the average daily earnings by 220 instead of by 300.

Richard v. Central Iowa Fuel Co. (Iowa), 166 Northwestern 1059, p. 1060.

PURPOSE AND CONSTRUCTION—MASTERIAL DUTIES.

The legislature in framing subdivisions c (4) of section 2477m (Supp. Code 1913), had in mind the condition of the law touching the subject matter covered by the statute and recognized that an employer owed certain masterial duties to his employees, a failure to discharge which resulting in injury, created a liability on the part of the em-

ployer. The legislature also recognized that it was the duty of an employer, among other masterial duties, to exercise reasonable care to see that an employee had a reasonably safe place in which to work; that it was the duty of the employer to furnish the employee reasonably safe tools and appliances with which to work; that a failure to do either, resulting in injury, created a liability on the part of the employer. It also recognized that these matters were susceptible of proof; that under the law as it had existed the burden rested on an injured employee to prove the negligence of the employer in respect to these matters as well as the injury itself. The legislature may have assumed that ordinarily no injury arises to an employee when the employer has discharged all his legal duties to the employee and the legislature saw fit to provide that an injury occurring to an employee while in the course of his employment is presumptive evidence that the employer failed to discharge some of these duties and the legislature thought it proper and wise to provide that in all suits growing out of injuries arising in this way the burden should be on the employer to exculpate himself and to show that the injury did not result from any failure on his part to discharge his duty to the employee.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 392.

RELATION OF EMPLOYER AND EMPLOYEE—RIGHT TO COMPENSATION.

It is the work which the workman is performing at the time he is injured that determines whether or not he is at the time the servant of another and is engaged in the discharge of that duty under his employment. A person employed as a teamster, and belonging to the class called extras, furnished his own wagon and team and was paid by the tonnage hauled. There was no regular employment, but the employment was irregular, extending for a day or two at a time. The teamster would sometimes procure his own orders and bring them with him to the mine, obtain the coal, and was charged therefor at the regular mine price, which was accounted for and paid when the coal was delivered and the amount collected. In such case the teamster received, as his profit or compensation for hauling, the difference between the mine price and the price on reselling. A teamster thus engaged and killed while hauling coal for himself with his own team and wagon, in his own way, to his own home, and over the route which he chose for himself, and for which delivery he was not to receive any pay from the mine operator, and who was charged for the coal the mine price, was not an employee of the mine operator within the meaning of the workmen's compensation act of Indiana.

Sugar Valley Coal Co. v. Drake (Ind. App.), 117 Northeastern 937, p. 938.

ACTION FOR INJURIES—PLEADING.

The Illinois workmen's compensation act of 1913 provides that no common law or statutory right to recover damages for an injury sustained by an employee while in the line of his duty, other than the compensation provided in the act, shall be available to any employee who is covered by the provisions of the act. It is essential, therefore, to the statement of a cause of action for a negligent injury by a miner against a mine operator that it should appear that the miner was not covered by the provisions of the act.

Beveridge v. Illinois Fuel Co. (Illinois), 119 Northeastern 46.

PLEADING—STATEMENT OF CAUSE OF ACTION—NEGATING DEFENSE.

In pleading a cause of action under the Iowa workmen's compensation act (sec. 2477m, subdivision 4 (4), Supp. Code, 1913), a plaintiff is not bound to allege more than he is required to prove in order to establish his right to recover. He is not required to negative any fact which the defendant is bound to allege and prove as a defense. The fact that his cause of action may be bottomed on negligence does not require him to aver any negligence, or to set out the specific acts of negligence; and he is not required under the statute to plead or prove specific acts of negligence as a basis for a recovery. It is sufficient if he alleges and proves the employment, and that he was injured in the course of his employment and the law steps in and says in effect that the injury is presumed to be the result of the employer's negligence, and the burden rests on him to show that this is not true, and unless he does so, he shall be holden to answer for the injury.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 393.

ACTION FOR INJURIES—PRESUMPTION AND PLEADING.

The Illinois workmen's compensation act provides that every employer engaged in mining shall be conclusively presumed to have elected to provide and pay compensation according to the provisions of the act unless and until notice in writing of his election to the contrary is filed with the industrial board and until such mine operator shall have either furnished his employees personally or posted at a conspicuous place where the miner is employed a copy of his notice of election not to provide and pay compensation according to the act, and until such time it is unnecessary for a miner suing for injuries to allege that the mine operator has elected not to pay compensation according to the act as it is unnecessary to allege a fact which the law presumes to exist.

Beveridge v. Illinois Fuel Co. (Illinois), 119 Northeastern 46.

**INJURIES ARISING "OUT OF AND IN THE COURSE OF EMPLOYMENT"—
MEANING.**

A miner injured while working in a mine in Alaska brought suit under the workmen's compensation act to recover compensation for injuries received by him in the course of his employment and to recover damages for the aggravation of his injuries and for his suffering by reason of the mine operator's negligence to furnish him timely and sufficient surgical and medical and hospital care. The plaintiff alleged that under the mine operator's rules the sum of \$1.50 per month had been deducted from his wages for hospital dues and this entitled him to care in a hospital and to competent surgical and medical attention at the expense of the employer. The provision permitting a recovery for death or injury arising "out of and in the course of employment" is limited to injuries arising out of the employment where there is a causal connection between the working conditions and the injury and where it is possible to trace the injury to the nature of the employer's work, or to the risk to which the employer's business exposes the employee. The provision embraces only those accidents which happen to an employee while he is engaged in the discharge of some function or duty which he is authorized to undertake and which is calculated to further directly or indirectly the master's business. It can not be held to include the aggravation of an injury caused by the negligence or unskillful medical treatment of his injuries, as these do not rise "out of and in the course of employment" within the meaning of that phrase as used in the statute.

Ellamar Mining Co. v. Possus, 247 Federal 420, p. 422.

ACCIDENT ARISING IN COURSE OF EMPLOYMENT—BURDEN OF PROOF.

In all cases brought under the workmen's compensation act of Indiana the burden is on the claimant to furnish the evidence from which the inference can reasonably be drawn that the injuries complained of were caused by an "accident arising out of and in the course of his employment," within the meaning of the workmen's compensation act.

Sugar Valley Coal Co. v. Drake (Ind. App.), 117 Northeastern 937.

**INJURY WHILE IN SCOPE OF EMPLOYMENT—NEGLIGENCE—PRIMA FACIE
CASE.**

When a miner in an action for damages for injuries under the Iowa workmen's compensation act has established the employment and has shown that the injury arose out of and in the course of his

employment, a prima facie case of negligence is made against the mine operator and this prima facie case rests on the assumption that if the employer had discharged his duties the condition would not exist which produced the injury to the employee while in the course of his employment.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 393.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

WORKMEN'S COMPENSATION ACT OF ALASKA IS ELECTIVE—ELECTIVE PROVISIONS.

The workmen's compensation act of Alaska is elective and not compulsory, and applies to those only who choose to avail themselves of its provisions and agree to abide by its terms. All rights thereunder have their origin in the agreement of the parties. An injured employee does not recover on a liability arising out of the employer's negligence, but on a liability arising out of contractual obligation, and which exists irrespective of the employer's negligence. The act eliminates all consideration of tort, penalty, or negligence.

Ellamar Mining Co. v. Possus, 137 Federal 420, p. 423.

EMPLOYER'S ELECTION NOT TO PAY COMPENSATION—PROOF OF NEGLIGENCE.

A mining company that elects not to provide and pay compensation according to the workmen's compensation act of Illinois is deprived of certain defenses, and a miner suing such mining company for damages for injuries caused by its alleged negligence is not relieved by the statute from proving negligence of the mining company.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 437.

FAILURE OF MINE OPERATOR TO ELECT—PROOF.

In an action by a miner under the Illinois workmen's compensation act for damages for injuries received while working in a mine it is not sufficient to prove that the mine operator refused, and had elected not to come under the provisions of the workmen's compensation act (*Laws 1913*, p. 335), by introducing into evidence a notice signed by the president and secretary of the mining company, in which it was stated that it was given in conformity with the provisions of section 2 of the act. But in addition to this it is necessary to prove that a copy of such notice was either furnished to the miner or was posted at the place where he was employed.

Beveridge v. Illinois Fuel Co. (Illinois), 119 Northeastern 46,

REJECTION BY OPERATOR—INJURY TO MINER—PRESUMPTION OF NEGLIGENCE.

When a coal mine operator elects to reject the provisions of the Iowa workmen's compensation act and a miner sues for damages for injuries received in the course of his employment, proof that the injury was so received makes a *prima facie* case, or creates the presumption of negligence, and the burden is then upon the mine operator to show his freedom from negligence. Proof of the contributory negligence of the injured employee is not a defense, but the employer to escape liability must show that he was not negligent in respect to the particular matter complained of, or that his negligence did not proximately cause the injury, or that the injury was due to the willful misconduct of the employee, or that the employee was intoxicated.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 392.

NEGLECT—PRESUMPTION FROM INJURY.

The workmen's compensation act of Iowa (sec. 2477m, subdivision 4 (4), Supp. Code 1913) expressly provides that where an employer has rejected the provisions of the act it shall be presumed in an action by an employee for damages for an injury sustained in the course of his employment that such injury was a direct result and grew out of the negligence of the employer, and that such negligence was the proximate cause of the injury and the burden of proof rests upon the employer to rebut the statutory presumption of negligence.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 392.

Erickson v. Mapleblock Coal Co. (Iowa), 167 Northwestern 105, p. 106.

FINDINGS OF INDUSTRIAL BOARD—FORCE AND EFFECT.

The finding of the Industrial Board on claims presented under the workmen's compensation act of Indiana have the same force as the finding of a court or the verdict of a jury and are not to be set aside if there is any evidence on which they can rest.

Sugar Valley Coal Co. v. Drake (Ind. App.), 117 Northeastern 937.

AWARD OF INDUSTRIAL BOARD—ATTORNEY FEES.

Where the arbitrator and the Industrial Board render a decision in favor of a claimant and no review is petitioned for or had by the party paying the compensation, the Illinois Workmen's Compensation Act gives no authority to allow an attorney's fee to be taxed against the party paying the compensation unless he refuses to pay such compensation, or some of the installments thereof, when they become due.

McMurray v. Peabody Coal Co. (Illinois), 118 Northeastern 29, p. 33.

**APPEAL FROM AWARD OF INDUSTRIAL BOARD—JURISDICTION AND
AUTHORITY OF COURT.**

On appeal from an award for compensation allowed by the Industrial Board under the provisions of the Illinois workmen's compensation act of 1913, the circuit court is without jurisdiction to review the action of the Industrial Board when a certified copy of the order of the board is filed to obtain judgment in accordance with the statute. The court is only authorized to enter a judgment upon the showing being made that the requirements of the statute have been met.

McMurray v. Peabody Coal Co. (Illinois), 118 Northeastern 29, p. 31.

APPEAL FROM WORKMEN'S COMPENSATION BOARD—FINAL JUDGMENT.

On appeal from the workmen's compensation board fixing the compensation for the death of a miner, it is not the duty of the common pleas court to remand the case to the board for a further and final action, but it is the duty of the court to enter a final judgment on awarding to the dependent the amount due.

Rakle v. Jefferson & Clearfield Coal Co. (Pennsylvania), 103 Atlantic 302.

**APPLICATION FOR JUDGMENT—TRUTH OF MOTION AND AFFIDAVITS—PRE-
SUMPTION.**

On an application to a court for a judgment on an order made by the Industrial Board the court must assume that the facts set forth in the motion or affidavits are true where no counter affidavits are filed.

McMurray v. Peabody Coal Co. (Illinois), 118 Northeastern 29, p. 32.

JUDGMENT ON AWARD—INTEREST ON PAST-DUE INSTALLMENTS.

Under the general statute of Illinois providing for interest when judgment is entered upon any award, a claimant under the workmen's compensation act is entitled to interest at the rate of 5 per cent per annum on an award of the Industrial Board on the past-due installments from the time the same become due and payable under the provisions of the award.

McMurray v. Peabody Coal Co. (Illinois), 118 Northeastern 29, p. 33.

COMPUTATION OF COMPENSATION.

In the operation of a coal mine in Iowa it was the custom for the mine operator to furnish the miners powder and blacksmithing for the special purpose of the employment and at specified prices under an agreement that these advances should be repaid out of the

wages. In an action by an injured miner under the workmen's compensation act of Iowa the rule established for compensation under such circumstances is stated thus: "Deduct from the gross earnings for the year preceding the injury the amount expended for powder and blacksmithing; divide this sum by a number equal to the number of days worked by the miner in that year, which was 220; multiply the result by 220 and divide by 104."

Richard v. Central Iowa Fuel Co. (Iowa), 166 Northwestern 1059, p. 1061.

COMPENSATION—DEDUCTIONS FOR ADVANCES.

Section 8 of the original workmen's compensation act of Iowa (sec. 2477m7, Code Supp. 1913) prohibits any contract, rule, regulation, or device whatsoever that shall operate to relieve an operator in whole or in part from any liability created by the act. If this provision stood alone there could be no deduction for powder and blacksmithing furnished by the employer to the miner, but the provision does not stand alone. Section 2477m15 (g) provides that for the purposes of computation, the earnings shall not include any sum which the employer has been accustomed to pay the employee to cover any special expenses entailed on him by the nature of the employment. In the agreement between the mine operator and the miner advances of this nature were taken into consideration in fixing wages. It seems that a mine operator had customarily made payments to the miner to cover the special expense of powder and blacksmithing which was entailed on the miner by the nature of his employment. The court concludes that the advancement made for such purpose can not be considered as earnings.

Richard v. Central Iowa Fuel Co. (Iowa), 166 Northwestern 1059, p. 1061.

AVERAGE WEEKLY EARNINGS—COMPUTING COMPENSATION.

The workmen's compensation act of Iowa (Code Supp., 1913) prescribes clearly that the compensation to an injured employee shall be half of the average weekly wages received. In order to ascertain what these average weekly earnings are there shall first be found the annual earnings during the year next preceding the injury; and these annual earnings shall be arbitrarily treated to be 300 times the average daily earnings. "Average weekly earnings" are as a matter of statute the fifty-second part of 300 times the average daily earnings of the year preceding.

Richard v. Central Iowa Fuel Co. (Iowa), 166 Northwestern 1060.

CONTRIBUTIONS TO SUPPORT—DEPENDENCY NOT REQUIRED.

The Illinois workmen's compensation act of 1913 (Laws 1913, p. 337) provides for compensation in case the employee leaves any child

whom he was under legal obligation to support, and also where the employee leaves children to whose support he had contributed within four years previous to the time of his injury. Under the latter provision it was not necessary that the children should be dependent upon the deceased, but only that the deceased had contributed to the support of the children within four years previous to his death. Under this provision if contributions to the support of the applicants were actually made within four years previous to the death of an employee the fact that the beneficiaries were not in such circumstances as to need the support of the deceased is immaterial. Neither is it material that the contributions indirectly aided the husbands of the daughters of the employee where they were direct contributions of a substantial nature to the daughters themselves.

Peabody Coal Co. v. Industrial Board (Illinois), 117 Northeastern 983, p. 984.

ALASKAN WORKMEN'S COMPENSATION ACT—RECOVERY FOR AGGRAVATION OF INJURY.

Under this act an injured person can not recover for aggravation to his injuries as the act limits the recovery to cases of death or injury arising "out of and in the course of employment." This phrase as used embraces only accidents which happen to an employee while he is engaged in the discharge of some function or duty which he is authorized to undertake and which is calculated to further, directly or indirectly, the master's business. An injury arises out of the employment if there is a casual connection between the working conditions and the injury, and it must be possible to trace the injury to the nature of the employer's work or to the risks to which the employer's business exposes the employee. Injuries arising "out of and in the course of employment can not include aggravations caused by insufficient medical attention furnished by the employer pursuant to an agreement with the employees to furnish competent medical attention in case of the employees' injury or illness.

Ellamar Mining Co. v. Possus, 247 Federal 420, p. 422.

REPEAL OF STATUTE—DEPENDENCY.

The provision of the Illinois workmen's compensation act of 1913 (Laws 1913, p. 337), providing that where an employee left children to whose support he had contributed within four years previous to the time of his injury, was repealed by the act of 1917 (Laws 1917, p. 490). The act of 1913 did not require dependency as a condition of compensation, but dependency is now the test.

Peabody Coal Co. v. Industrial Board (Illinois), 117 Northeastern 983, p. 984.

ACTION FOR WRONGFUL DEATH.**APPLICATION TO NONRESIDENT ALIENS.**

The statute of Utah (sec. 2912) gives a right of action for a wrongful death for the benefit of the widow and minor children. The statute is general in its terms and contains nothing indicating an intention to restrict its application to residents of the State or of the United States. Under its general provisions a right of action may be brought for the wrongful death of a miner in Utah for the benefit of the widow and minor children who are nonresident aliens, subjects of the Kingdom of Italy.

Bingham Mines Co. v. Blanco, 246 Federal 936.

ACTION BY ADMINISTRATOR—PLEADING.

In an action by an administrator for damages for the wrongful death of his intestate, a complaint is insufficient that fails to aver that the plaintiff sues as the administrator.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 550.

TIME FOR BRINGING SUIT—STATUTE OF LIMITATIONS.

A miner was killed while working in a coal mine in the State of Kentucky. He left surviving no widow, children, or father. His mother, a married woman, was appointed administratrix by the probate court of the proper county and thereupon brought an action to recover damages for the death of her son on the ground of negligence on the part of the mining company. The statute of Kentucky expressly provides that a married woman shall not be appointed executrix or administratrix. The Kentucky statute also provides that actions for injuries to persons or for wrongful death must be brought within one year. After the suit was begun the mother resigned her position as administratrix and a competent person was appointed. The new administrator was appointed more than a year after the death of the intestate. The probate court had jurisdiction to appoint the mother and it is a court of general jurisdiction and the appointment so made was valid until attacked in a direct proceeding and can not be considered as void in a collateral attack. On her resignation and the appointment of a new administrator the proceedings were maintainable by substituting the name of the new administrator, and the one-year statute of limitations would not bar the prosecution of the case by the new administrator as it was not in fact or in effect a new action.

Salzer v. Consolidated Coal Co., 246 Federal 74, p. 795.

DECLARATIONS OF DECEASED—PROOF.

In an action for the wrongful death of a miner the declarations of the deceased made 30 minutes after the accident to associate miners as to how the accident happened were but expressions of opinion as to the cause and consequence of the accident and were the narrative of a past event and consequently no part of the *res gestæ* and were improper.

Moreno v. New Guadalupe Mining Co. (Cal. App.), 170 Pacific 1088, p. 1089.

PHYSICIAN AND PATIENT—PRIVILEGE WAIVED.

In an action for the wrongful death of a miner where the administratrix and her witnesses testified fully and freely as to the nature of the injuries and gave publicity to all that ailed the decedent, this is sufficient to break the seal of privacy privileged by the statute. When a plaintiff makes voluntary exploitation of the decedent's injuries and the claimed cause of his death an inquiry into the symptoms exhibited by the deceased and the cause of his death thus initiated by the plaintiff can legitimately be brought to a close only by the testimony of the attending physician concerning the same subject matter, and the privilege created by the statute is thereby waived.

Moreno v. New Guadalupe Mining Co. (Cal. App.), 170 Pacific 1088, p. 1092.

LIENS.

EXTENT.

The statute of Missouri (sec. 8436, R. S. 1909) gives a miner a lien for his wages against the owner's mine and the property connected with its operation. A miner's lien is to be enforced upon the terms and procedure for enforcing mechanic's liens.

Berry v. Rombauer Coal Co. (Mo. App.), 198 Southwestern 1130.

ASSIGNMENT OF CLAIMS—SEPARATE LIENS.

The claims and accounts of laborers in a coal mine of a coal mine operator assigned to one and the same person remain separate, each depending on its own merit and liable to whatever defense there may be to it either as a demand or to its right of enforcement by lien. But all such claims may be joined in one suit by the assignee, but he must file a separate lien for each, since each has its distinct contract to support it and each has its distinct time of accrual to govern the limited time when a lien for its enforcement must be filed.

Berry v. Rombauer Coal Co. (Mo. App.), 198 Southwestern 1130.

SEPARATE CONTRACTS NOT MINGLED.

Materials furnished under distinct contracts can not be mingled in one account and a lien obtained for the aggregate. This rule applies to miners' liens.

Berry v. Rombauer Coal Co. (Mo. App.), 198 Southwestern 1130, p. 1131.

LABORER'S ACCOUNTS—SEPARATE LIENS.

The accounts and claims of laborers in a coal mine for services rendered under distinct contracts are separate and distinct liens, particularly where the contracts were with different persons. The papers or notices for such liens must be separately filed with the circuit court within the period of limitations for each.

Berry v. Rombauer Coal Co. (Mo. App.), 198 Southwestern 1130, p. 1131.

ASSIGNEE OF MINER'S LIEN—ENFORCEMENT.

The assignee of a mechanic's lien may bring suit in his own name and enforce such assigned lien as fully as if the claim had been filed by the original claimant. The holder or the assignee of a miner's lien is given the right to enforce his lien upon the terms and procedure for enforcing mechanic's liens.

Berry v. Rombauer Coal Co. (Mo. App.), 198 Southwestern 1130.

SEPARATE LIENS—ENFORCEMENT.

An assignee of the separate accounts of laborers and miners working in a mine can not file the papers in the clerk's office as a single lien and enforce the separate and distinct accounts in an action as a single lien.

Berry v. Rombauer Coal Co. (Mo. App.), 198 Southwestern 1130, p. 1131.

MINES AND MINING OPERATIONS.

RELATION OF MASTER AND SERVANT.

WHAT CONSTITUTES.

A teamster engaged in hauling coal with his own wagon and team from a mine, and who paid the regular mine price for the coal received by him and made his profit or compensation by the difference in the price paid at the mine and the price received on resale by him, was not, while so engaged in hauling coal, the servant or employee of the mine operator.

Sugar Valley Coal Co. v. Drake (Ind. App.), 117 Northeastern 937, p. 983.

STATUS—PLEADING.

A complaint in an action for damages for the death of a miner is insufficient if it fails to set up the relation between the intestate and the mine operator and fails to show that the intestate had a right to be in the mine at the time of his death or that fails to show the duty owing such intestate by the mine operator. It is not sufficient to aver that the deceased was in the service or employment of the mine operator in or about the business of mining, and while the deceased was in the operator's mine "in or about said business as aforesaid," a fire broke out and that the intestate was burned is not sufficient to charge that he was in the mine in the service or employment of the mine operator.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 550.

RELATION AND LIABILITY—QUESTION OF FACT.

A workmen assisting in cleaning out a gas well was killed by the fall of a derrick. The company cleaning out the well was employed by an oil and gas company to clean the gas wells on the operator's property and that belonged to the gas company and which furnished gas to the company engaged in cleaning out the wells for the operation of its business. There was some evidence to show that the foreman or manager of the company controlling the operations had not employed the deceased workman to assist in cleaning the particular well. There was evidence to show that the employees of the company operating, for some time prior thereto, had been in the habit of ren-

dering assistance in connection with the wells of the oil company, and that this was done with the knowledge and consent of the company cleaning the wells. Under such state of the evidence it was a question of fact to be determined by the jury whether the deceased workman was an employee of the company cleaning the wells and not the employee of the oil company.

Brown v. Kittanning Clay Products Co. (Pennsylvania), 102 Atlantic 948.

ACTIONS—PLEADING AND PROOF OF NEGLIGENCE.

PLEADING NEGLIGENCE—GENERAL AVERMENTS.

Ordinarily in pleading negligence a general averment in the description of the defect may be sufficient, but the rule can not be extended as to generality of defects; and in an action for damages for the death of a minor caused by an explosion of gas in a mine, an averment "that a portion of defendant's mine was defective" is insufficient as a charge of negligence.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 550.

ELEMENTS OF NEGLIGENCE—PLEADING AND PROOF.

A complaint by a miner for injuries caused by the alleged negligence of the mine operator must by averment show: (1) That the mine operator was under legal duty to protect the complainant from the injury of which he complains; (2) that the operator failed to perform such duty; (3) that the injury complained of was proximately caused by the operator's negligence. These elements combined constitute the cause of action, and if the complaint fails to disclose the presence of all of them it is insufficient as a question of pleading to entitle the complainant to recover. Under such a complaint the proof must correspond with the allegations, and unless it establishes them in their general scope and meaning the cause of action is not made out. The evidence to support the allegation may be either direct or circumstantial, but it must be sufficient to show *prima facie* that all the elements constituting the cause of action were present. Where in such a case the evidence fails to show that the mine operator omitted any precaution that ordinary care and diligence would have suggested as necessary to render the stope in which the complainant worked reasonably safe for him while engaged in doing the work assigned to him, proof merely that the injured miner was in the employ of the mine operator and that he was injured by a fall of rock while working in a stope establishes no liability on the part of the mine operator.

Barry v. Badger (Montana), 169 Pacific 34, p. 36.

PLEADING AND PROOF OF NEGLIGENCE.

A general charge of negligence in an action against a mine operator is sufficient where the right of recovery is based on the gross negligence of a fellow servant, as the allegation of negligence includes gross as well as ordinary negligence.

Borderland Coal Co. v. Edwards (Kentucky), 100 Southwestern 792, p. 793.

The operator of a drilling machine in a mine, injured by a fall of rock from the roof outside of the place he was required to inspect and keep safe, charged in an action for damages that the mine operator failed to properly timber a certain stope in the mine, that he negligently omitted to inspect the roof, sides, and back of such stope; that he negligently failed to "pick down" the loose rock and earth from the roof and sides of the stope; that he negligently gave assurance to the injured miner that the stope was in a safe condition. A plaintiff in such an action is entitled to have the case submitted to the jury upon the acts of negligence of which he produced evidence. It was not necessary for him to establish every act of negligence charged, whether of commission or omission, but it was sufficient if he established one or more of them by a fair preponderance of the evidence.

Ulrich v. Utah Apex Mining Co. (Utah), 169 Pacific 263, p. 264.

ALLEGATIONS OF NEGLIGENCE NOT INCONSISTENT.

In an action for damages for the death of a helper in a drilling crew while removing a pipe or drill stem from an oil well that was being drilled, caused by the breaking of a steel hook and striking the helper on the head and resulting in his death, the allegations of negligence were to the effect: (1) That the hook was not large enough or strong enough and was not intended to withstand the strain to which it was put; (2) that the drilling company neglected to make the necessary inspection to observe signs of breaking; (3) that the foreman in charge of the work handled the apparatus carelessly and in such a manner as to subject the hook to sudden jerks. These allegations of negligence are not subject to the charge of being inconsistent as no one of the allegations contradicts another.

Haynes v. Fisher Oil Co., 142 Louisiana, 77 Southern 781, p. 782.

INSUFFICIENT CHARGE OF NEGLIGENCE.

In a complaint and petition by a miner injured while assisting in the operation of an electrical mining machine it was averred, as a preliminary statement, that the mine operator negligently employed an inexperienced jack setter in the place of the regular and experi-

enced jack setter. But the petition and complaint in the part stating the particular acts of negligence failed to include the alleged negligence of employing an inexperienced jack setter, but stated other acts of negligence as causing the injuries complained of. This preliminary ground of negligence is therefore beyond the issues made by the pleadings and is not to be considered and is without weight as an element in the case.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1073.

EVIDENCE INSUFFICIENT TO SHOW NEGLIGENCE.

A coal-mine operator employed in the operation of an electrical coal-cutting machine, a machine boss, a machine operator, a jack setter, and two shovelers. It was the duty of the shovelers to shovel behind the machine and to take down the jack attached to iron rails on which the machine ran and to uncouple the rails so that they could be replaced in front of the machine and to remove and clear away dirt and other materials from under the layers of coal. It was the duty of the jack setter to see that the roof of the mine where the machine worked was in a reasonably safe condition, and if not to notify the machine operator and have the roof made safe. The mine operator is not to be charged with negligence and made liable for injuries to one of the shovelers caused by a fall of slate from the roof on the alleged ground of negligence in failing to furnish the shoveler a safe place, where the evidence is conflicting as to the duty of the jack setter to inspect the roof, and where the evidence shows that the roof at the time and place where the jack was set appeared to be safe and solid, and that the operations of the heavy machine might jar and loosen the roof, and where it appeared that the injury was caused by a fall of slate after the jack was removed by the jack setter, and where it appeared that the method of operating and the men employed in connection with the operation of the mining machine were usual and customary and regarded as sufficient and safe by the mine operator and by the miners in the operation of the cutting machine.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1074.

PROOF OF SUBSEQUENT REPAIRS NOT ADMISSIBLE TO PROVE NEGLIGENCE.

In an action for the wrongful death of a miner the proof showed that he was working as a mucker in the entry through which there was suspended a live trolley wire, and that his death was caused by coming in contact with this wire. Proof was admitted on repeated questions of the plaintiff's counsel as to certain repairs made in the entry after the accident. It is a settled doctrine that in actions for

injuries alleged to have been caused by defective machinery or appliances or places of work, proof of subsequent alterations or repairs has no legitimate tendency to prove negligence at the time of the accident and is calculated to prejudice the defendant, and it is error to admit such proof.

Bingham Mines Co. v. Bianco, 246 Federal 986, p. 987.

REJECTION OF WORKMEN'S COMPENSATION ACT—PROOF OF NEGLIGENCE ESSENTIAL.

In an action by a miner for damages for injuries occasioned by the alleged negligence of a mining corporation, the burden is on the injured miner to establish the negligence on the part of the mining corporation, where it has elected not to accept the provisions of the Illinois workmen's compensation act.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 437.

STATEMENTS OF INJURED PERSON—RES GESTAE.

The statements of an injured person as to the object that struck him are admissible in evidence in an action for damages for the injury and resulting death, as part of the *res gestae*, where it appears that such statements are spontaneous and sincere responses to the actual sensations and perceptions already produced by the external shock from the blow.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 33.

ACTION BY INJURED PERSON—EXPLANATION BY WITNESS—RES GESTAE.

A person employed to do certain work for an oil company was, while passing over a small gas main, struck and injured by reason of a break in the pipe and the sudden recoil of the pipe due to the great pressure of the gas. The blow rendered him unconscious, but on regaining consciousness and in response to a question as to what hurt him he pointed to the pipe line and said: "That hurt me! It struck me in the back." The actions of the injured person in pointing out an object which he claimed struck him are proper to be shown by the witness to whom he made the statements that are themselves admissible in evidence, where such actions tend to illustrate and make such statements intelligent.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 33.

PARTY'S RIGHT TO HAVE CASE SUBMITTED UPON ISSUES PLEADED.

In an action by a miner for damages for the loss of the sight of an eye caused by a splinter of steel flying from an alleged defective

hammer wielded by another employee, the plaintiff is entitled to have his case submitted upon the issues pleaded and presented, and to have such issues stated by way of instructions of the court free from commingling with injected issues not pleaded or presented and which may have caused an adverse verdict.

Cavoretto v. Alaska Gastineau Mining Co., 245 Federal 853, 855.

NEGLIGENCE OF OPERATOR.

ACTIONABLE NEGLIGENCE—WHAT CONSTITUTES.

Negligence of a mine operator consists in the omission to do something which it was his duty to do, or the commission of some act which it was the duty of the mine operator not to commit, the commission or doing of which was the proximate cause of the injury.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 392.

ACTIONABLE NEGLIGENCE—PLEADING—PRESUMPTION.

The mere pleading by an injured miner that he was in the employment of the defendant, a mine operator, who was operating a coal mine and that he was injured and that the injury arose out of and in the course of the employment, and that the operator had elected to reject the provisions of the workmen's compensation act, ordinarily would not be sufficient upon which to base an action for negligence. But the workmen's compensation act of Iowa expressly provides that where a mine operator has elected to reject the provisions of the act it shall be presumed that an injury to an employee was the direct result and growing out of the negligence of the employer, and that such negligence was the proximate cause of the injury.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 392.

ELEMENTS OF ACTIONABLE NEGLIGENCE.

In an action by a miner for personal injuries caused by the alleged negligence of the mine operator the elements constituting actionable negligence are: The existence of a duty on the part of the operator to protect the miner; the breach of that duty by the operator; and an injury to the miner proximately resulting therefrom. When any one of these three essential elements are wanting in a complaint or petition then such complaint or petition does not state a cause of action.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 48.

VIOLATION OF DUTY.

Negligence presupposes a duty, and if there is no duty to do a thing, there can be no liability predicated on a failure to do it. It

is the duty of a mine operator to timber that part of a room that a miner has worked out and in which the operator has placed tracks and runs cars for hauling out the coal mined. The failure to properly timber or prop this part of the room by reason of which the miner working in the room was injured is actionable negligence and renders the mine operator liable.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 107.

WANT OF NEGLIGENCE—MATTER OF LAW.

A car driver in an action for damages for injuries caused by being caught between the car and the side of the entry, charged the mine operator with negligence in failing to maintain a sufficient space between the car and the entry and in furnishing the driver with vicious and unruly mules to drive to the car. On the trial of the case the court may as a matter of law determine that neither the nearness of the mine wall to the track nor the speed at which the mules were going was the proximate cause of the miner's injuries.

Mayhan Jellico Coal Co. v. Bird (Kentucky), 201 Southwestern 306, p. 307.

UNSAFE CONDITION MADE IN PROGRESS OF WORK.

A mine operator is not to be charged with negligence in permitting the mine roof in an entry where the miner worked to be unsafe and dangerous, and that it was the duty of the operator to have properly propped and capped and braced the roof at that place, where the only reasonable inference from the proof is that the unsafe condition which resulted in the injuries complained of developed in the progress and as a result of the miner's work, of which he alone knew or had the opportunity to know.

Elk Horn Mining Corp. v. Vahoose (Kentucky), 200 Southwestern 921, p. 922.

CONCURRENT NEGLIGENCE OF OPERATOR AND FELLOW SERVANT.

A mine operator may be negligent in furnishing a miner with a defective and unguarded insulator attached to a live wire, and in directing the miner to hold the insulator while other employees attached the wire to another pole; and the fact that the employees who were attaching the wire to the pole were negligent in jerking the wire, so that the miner's hand came in contact with the live wire, will not prevent a recovery against the mine operator. If the injury was due to the concurrent negligence of the mine operator and the fellow employees, the operator is liable.

Elk Horn Mining Corp. v. Pitts (Kentucky), 201 Southwestern 9.

INJURY TO TIMBERMAN—LIABILITY.

A miner was injured by a fall of rock or slate from the roof of a mine while in the act of timbering an unsafe place. The miner was

a member of the timber crew whose duty it was to perform such service. He was carrying a prop for the purpose of placing it under the roof, and while in the act of laying it down for the purpose of resetting, a piece of slate fell from the roof and injured him. The negligence relied upon in the action to recover damages was the failure of the mine operator to furnish him a reasonably safe place for work. He alleged in his complaint that while he was intending to prop the roof of the mine and place caps thereon to make the same safe, the mine operator permitted the mine roof to become unsafe, dangerous, and defective, and by reason of the operator's failure to use ordinary care for his safety the slate or rock fell and injured him. Under such circumstances the mine operator can not be charged with actionable negligence. The rule requiring an operator to furnish a safe place for a miner does not apply where the miner is employed himself to make the dangerous place safe.

Charles v. Elk Horn Mining Co. (Kentucky), 200 Southwestern 461.

FAILURE TO PREVENT MINER FROM USING IRON TAMPING BAR.

In an action by a miner injured by an explosion of a powder cartridge, the negligence charged as the basis of the action was that the operator permitted and did not prevent the injured miner from using an iron or steel tamping bar without a copper or other soft metal head. The miner was certified under the Pennsylvania statute and was not only a proper person, but the only kind of a person lawfully authorized to do the work he was doing. The theory of the action was that the steel tamper must have struck "sulphur", thereby producing a spark which ignited the cartridge and caused the explosion, and this train of circumstances happened in a damp hole and had never before happened to the knowledge of the injured miner. The Pennsylvania mining act (act of June 2, 1891, P. L. 192) expressly provides that in charging holes for blasting in slate or rock in a mine no iron or steel-pointed needles shall be used. But this prohibition applies to a tight cartridge and as the cartridge causing the injury was not tight the rule is inapplicable and the negligence of the operator could not be predicated on his permitting or his failure to prohibit the violation of a rule or law where it had no application.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 434.

VENTILATION—IMPROPER SYSTEM—ERRONEOUS INSTRUCTIONS.

A complaint in an action for damages for the death of a miner caused by an explosion of gas charged that the mine operator maintained a defective or improper system of ventilation, and there was

evidence from which the jury could infer negligence on account of the system used by the mine operator in ventilating the mine. Under these circumstances it was error for the court to charge the jury that it would not be authorized to find the defendant guilty of negligence because of and on account of the system used by the defendant in its mine of employing brushers to examine for and brush out gas in the mine.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 551.

PERMITTING UNCOVERED HOLE IN MINE CAR TRACK.

In an action by a miner for damages for injuries caused by stepping into an unguarded hole between the tracks where he was required to push cars of loaded coal, it was sufficient on the plaintiff's part to show the negligence charged in allowing such an uncovered hole to be in the path of the miner whose task was to push loaded cars over it. It was no part of his case to show it to be exceptional, or out of the usual custom in the operation of coal mines. But it is proper for the defendant in defending against such a charge of negligence to show that it was the custom to maintain such hole in the condition described whether from necessity or otherwise.

Clark v. Butler Junction Coal Co. (Pennsylvania), 102 Atlantic 952, p. 954.

DEFECTIVE PIPE LINE—INJURY TO CHILDREN—LIABILITY.

A corporation transporting natural gas by means of a pipe line negligently permitted a leak to exist in the line upon land and at a place having the appearance of and that was commonly used as a public highway in a settled community. Young children, including a boy and girl each about 6 years of age, were attracted by the escaping gas and played with it in various ways. The boy, at the request of the girl, lit the gas and the girl was badly burned. In an action for damages for the injuries sustained by the girl the natural gas company can not claim that the boy by thus intervening can shift the blame for the accident from the company to himself any more than can the injured girl, and neither of them being legally responsible or capable of appreciating the probable consequences of yielding to the temptation held out to them through the negligence of the company, that negligence must be regarded as the proximate cause of the accident and the responsibility for the consequences rests upon the gas company as the creator of the condition which suggested the act to the immature minds of the children and at the same time made its performance a source of danger to them.

Jackson v. Texas Co., 143 Louisiana, 78 Southern 137, p. 139.

DUTY OF OPERATOR TO FURNISH SAFE PLACE.**LIABILITY FOR FAILURE TO FURNISH SAFE PLACE.**

The operator of a drilling machine in a mine was required to inspect and keep safe that particular part of the mine in which he worked, but as to all other parts of the mine it was the duty of the mine operator to use reasonable care to inspect and keep safe and keep free from loose and falling rock the roof in the other parts of the mine; and any failure in the discharge of this duty resulting in an injury to the operator of the drilling machine renders him liable.

Ulrich v. Utah Apex Mining Co. (Utah), 169 Pacific 263, p. 264.

EXERCISE OF CARE.

A mine operator, like other employers, is required to exercise reasonable care in furnishing his miners a safe working place. But a mine operator is not an insurer of the safety of the miners employed, and there must be a failure to exercise the proper degree of care in order to create a liability on the part of a mine operator.

Barry v. Badger (Montana), 169 Pacific 34, p. 36.

FAILURE TO EXERCISE CARE NECESSARY TO LIABILITY.

A miner while engaged in drifting along a vein was injured by a fall of rock from an overhang in the stope above. The miner had had 25 years' experience in mines and was familiar with the formation in the mine in which he worked, and had worked in stopes where no timbering was necessary and such places were considered safe. The particular stope in which he was working was apparently not different from others in which he had worked and there was nothing unusual showing that it needed timbering. Some loose rock in the wall above had previously been removed and all that was believed to be dangerous was pried down, and back of this the wall appeared to be solid. The injured miner, and another experienced miner, had worked for several days in the stope, had examined the walls, including the overhang, and one had assisted in removing the only loose or dangerous rock discovered in the stope, and after this was removed the walls, to these experienced miners, seemed sufficiently safe. There was nothing to show that the mine operator had not exercised reasonable care to make safe the stope in which the miner was working at the time of his injury, and the facts and circumstances were not sufficient to create a liability on the part of the mine operator for a breach of his duty in providing a safe place.

Barry v. Badger (Montana), 169 Pacific 34, p. 35.

EXERCISE OF CARE—EXCEPTION TO THE RULE.

The rule that a mine operator must exercise ordinary care to provide his miner a reasonably safe place for work does not apply where the very work the miner is employed to do consists in making a dangerous place safe.

Charles v. Elk Horn Mining Co. (Kentucky), 200 Southwestern 461.

OPERATOR NOT INSURER OF MINER'S SAFETY—ACCIDENT NOT EVIDENCE OF NEGLIGENCE.

A mine operator is not an insurer of the safety of the employees in his mine; neither does the happening of an accident by which a miner is injured during the course of his employment, standing alone, furnish the basis for an inference of culpable negligence on the part of the mine operator.

Barry v. Badger (Montana), 169 Pacific 34, p. 36.

NOTICE AND TIME TO REMEDY NECESSARY.

In order to make a coal mine operator liable for a failure to perform his duty in furnishing a safe place for a miner to work the evidence must bring home to the mine operator notice of the unsafe condition of the place in time to remedy it before the accident and the injury complained of.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1075.

NOTICE OF CHANGED CONDITIONS.

It is the duty of a mine operator to furnish the miners with a reasonably safe place in which to work; but where the operator has furnished a reasonably safe place, notice must be brought home to him of any changed conditions in the place, brought about by the work of the miners, before he can be held liable for failure to furnish a safe place.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1075.

PRESUMPTION OF PERFORMANCE OF DUTY.

In an action for damages by an injured miner on the ground of the failure of the mine operator to furnish the miner a safe working place, the coal mine operator is entitled to the benefit of the presumption that he has performed his duty in this respect until the contrary appears, and it devolves upon the injured miner in such case to show by the preponderance of the evidence that the mine operator failed to perform his duty in this respect in consequence of which the complaining miner received the injuries.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1074.

DANGERS ARISING IN PROGRESS OF WORK.

The law places upon a mine operator no duty to provide against dangers arising in the progress of a miner's work and resulting therefrom.

Elk Horn Mining Corp. v. Vahoose (Kentucky), 200 Southwestern 921, p. 922.

APPLICATION OF DOCTRINE.

The safe place doctrine may not be applicable where the miner is engaged in removing pillars in a coal mine, but it does apply where the miner was expressly ordered by the mine foreman to continue the work of pulling the stumps and robbing the pillars.

Consolidated Coal Co. v. Deskins (Kentucky), 199 Southwestern 779.

LEAVING UNEXPLODED CHARGE OF DYNAMITE.

Where an unexploded charge of dynamite was negligently left in a hole in the wall of an entry in a coal mine which was a miner's working place and where the foreman failed to direct the miner not to work therein, but permitted him to do so, and the miner while engaged in drilling a hole in the entry in pursuance of his duties was injured by the explosion of the unexploded charge of dynamite, the negligence of the mine operator in leaving the unexploded charge of dynamite and in directing and permitting the miner to work on at his working place under such circumstances was the proximate cause of the injuries resulting from an explosion of the charge of dynamite.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 50.

DUTY TO PROP ROOF—AGREEMENT BETWEEN OPERATOR AND MINER.

In an action for the death of a miner caused by the fall of rock or slate from the roof of his room, proof was made of an agreement between the operator and the miner to the effect that in case a room has been properly timbered and from any cause it becomes dangerous so as to require double timbering, the mine operator shall, when notified by the miner, do the necessary work to protect the roadway. The proof shows that the foreman failed on notice to do anything to protect the roadway from falling slate. The miner discovered cracks in the slate which suggested imminent danger. The danger was in a place over the roadway and where it was the operator's duty to make the repairs upon notice, as it was at and over where the workmen must pass in gaining ingress and egress from the working face of the mine. The miner had a right on the failure of the foreman to make the place safe, to put in timber support not only for his own

protection against the negligence of the operator, but for the protection of others who might come in over the roadway, as well as for the protection of the operator's property. Such circumstances are sufficient to render the operator liable for the death of the miner caused by a fall of slate from the roof at the time he attempted to repair the same.

Mitchell v. Swanwood Coal Co. (Iowa), 166 Northwestern 391, p. 396.

Erickson v. Maple Block Coal Co. (Iowa), 167 Northwestern 105, p. 106.

DUTY TO PROVIDE SAFE APPLIANCES.

DUTY TO FURNISH SAFE APPLIANCES—CONTINUOUS INSPECTION.

It is the duty of a mine operator to furnish safe and suitable machinery and appliances for the use of employees, and this duty is not discharged by merely furnishing suitable machinery and appliances in the beginning, but comprises also a continuous oversight and inspection to keep them so.

Northern Central Coal Co. v. Barrowman, 246 Federal 906, p. 909.

FURNISHING SAFE PLACE AND APPLIANCES.

A coal-mine operator owes his employee, a miner, the duty of furnishing a safe place in which to work and safe appliances with which to work.

Gloss-Sheffield Steel & Iron Co. v. Russell, 247 Federal 289, p. 291.

APPLIANCES NOT FURNISHED BY MINE OPERATOR—LIABILITY.

The rule charging a mine operator, under many circumstances, with the consequences of his miners using an unsafe contrivance does not apply where the appliance causing the injury was not furnished by the mine operator and who was not charged with the duty of providing the same.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 435.

MINER MAY ASSUME THE OPERATOR HAS DISCHARGED HIS DUTY.

An employee is under no obligation to search for dangers in the machinery or appliances with which he is working, but he has a right to assume that his employer has performed his primary duty with respect to the machinery and appliances.

Northern Central Coal Co. v. Barrowman, 246 Federal 906, p. 910.

EXCEPTIONS TO RULE—SIMPLE TOOL.

Ordinarily it is the duty of an employer to exercise reasonable care to provide reasonably safe tools and appliances for employees;

but this rule has many modifications, and one is that where the tool is simple and the place of employment free from danger, the employee of mature age and experience, in the handling of such simple tool may not look to the employer for instruction in the use thereof or to inspect the tool, nor can he have damages for injuries resulting from his own handling of such an implement.

Consolidated Coal & Coke Co. v. Music (Kentucky), 190 Southwestern 1074.

USE OF SIMPLE TOOL.

An ordinary ax is a simple tool governed by the simple tool rule which is to the effect that where the mode of operating an instrument is so simple that a person of ordinary intelligence can at once perceive the mode of operating it and he voluntarily holds and uses it in such a way as to receive an injury and there is no reason why he should so hold or so use it he can not recover damages for the injury although the tool is defective.

Consolidated Coal & Coke Co. v. Music (Kentucky), 190 Southwestern 1074.

USE OF UNSAFE APPLIANCES.

An employer, an oil drilling company, is responsible in damages for an injury to an employee in an accident resulting from the company's attempt to use an apparatus that is generally recognized by men of practical and expert knowledge to be of insufficient size or strength to withstand the strain to which the employer put it.

Haynes v. Fisher Oil Co., 142 Louisiana, 77 Southern 781.

UNSAFE HOOK TO DRAW PIPE LINE.

A corporation engaged in drilling oil wells was sued for the death of an employee who was a helper in a drilling crew removing pipe or drill stem from an oil well. A steel hook that connected the cable with the end of the pipe broke under the heavy strain and struck the helper on the head, resulting in his death. The evidence shows that the attempt to use such a small hook to extract a line of pipe of the length and weight that the foreman was attempting to lift when the hook broke was not only bad judgment on his part but was contrary to the ordinary and customary method of doing such work. The stem consisted of 1,800 feet of 4-inch pipe and 41 feet of 6-inch pipe. The proof shows that it generally is considered dangerous to attempt to lift more than 1,200 or 1,500 feet of 4-inch pipe with a hook the size of the one that broke and caused the injury. A larger hook was present at the derrick intended to be used for such heavy work as was being performed when the accident happened, but the smaller hook was used because it could be handled

more conveniently and faster. The evidence was sufficient to sustain the charge of negligence in the use of an appliance of insufficient size or strength to withstand the strain to which it was put.

Haynes v. Fisher Oil Co., 142 Louisiana, 77 Southern 781.

ELECTRICAL APPLIANCES.

MAINTAINING UNINSULATED WIRES.

A mine operator maintaining a substation by which electricity is turned into his mine for its operation from a central electrical plant is not to be charged with negligence for maintaining uninsulated wires carrying 22,000 volts of electricity and is not liable for the death of a laborer employed in such substation whose duty it was to operate the switches by means of wooden poles some 6 feet in length attended with no danger, and who while acting outside of the scope of his duties and in violation of an express order and while on a ladder some 12 feet high was killed by coming in contact with the electrical wires.

Caulkins v. Wyoming Coal Mining Co. (Wyoming), 171 Pacific 265, p. 266.

UNGUARDED INSULATOR—DEGREE OF CARE.

A miner was injured by an electric current while assisting other employees in extending a trolley wire. The mine foreman handed an insulator to him to hold the wire until the other employees could tighten the wire to the next pole some 25 feet distant. The employees assisting jerked the wire and the miner's hand slipped and came in contact with the live wire attached to the end of the insulator. In attaching and tightening the wire it was likely to be pulled or jerked, and if the insulator was not guarded even a slight jerk might be sufficient to cause the hand of the miner to slip and come in contact with the live wire. In view of the dangerous instrumentality which the miner was required to handle, and the fact that the insulator was not protected by guards, or the current not released from the live wire is sufficient to make the mine operator's negligence a question of fact and for the jury to determine whether the operator used the utmost degree of care to provide the miner with safe appliance for work.

Elk Horn Mining Corp. v. Pitts (Kentucky), 201 Southwestern 9.

LIABILITY FOR DEATH OF ELECTRICIAN.

An electrician employed in a coal mine where electricity was used for hoisting and lowering cages was killed while working in a shaft repairing the electrical appliances by the sudden dropping of a cage. The evidence justified a finding that the accident was caused by the

negligent use of insufficient brake shoes that had been allowed to wear down from the original thickness of about four inches to an inch or less in places, and that the wear was too great to be taken up by the turnbuckle and that this defect in the brake shoe caused the cage to fall, and where reliance was had wholly on the setting of the lever and brake.

Northern Central Coal Co. v. Barrowman, 246 Federal 906, p. 909.

OPERATOR'S ASSURANCE OF SAFETY.

RELIANCE BY MINERS.

It was a custom at certain mines for laborers to remove the slate from the places where they were loading coal. Such a custom, if it existed, might be waived by the superior officers in charge of the mine and it was waived by the mine boss assuring the laborer that the place was safe. The rule applies especially where the laborers had never worked in the mine before and was wholly unfamiliar with the conditions and formations. Under such circumstances they had a right to rely upon the assurance given them by the mine boss.

Carter Coal Co., v. Fillpeck (Kentucky), 201 Southwestern, 468, p. 469.

An employee or miner has a right to rely on the superior knowledge of the employer or his foreman and it is only in cases where the danger is so imminent that no ordinarily prudent man would undertake the work regardless of what the employer or foreman said about it that he is barred on account of contributory negligence.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 Southwestern 590, p. 592.
Consolidated Coal Co. v. Deskins (Kentucky), 199 Southwestern 779.

EMPLOYEE'S KNOWLEDGE OF DEFECTS—EMPLOYER'S ASSURANCE OF SAFETY.

An employee called the foreman's attention to a defect in the appliance that he was using. The foreman by saying that he guessed it was safe and by ordering the employee to continue the use of the appliance could be construed by the employee, whose duty it was to obey his employer, as nothing less than an assurance that his fear of danger was ill-founded and that he could safely proceed with the work.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 Southwestern 590, p. 592.

CONDITION OF PREMISES—USE BY INVITEE.

A pipe-line company transporting gas in its line was invited by an oil company to use a private road or way owned and used by the oil company. The invitation by the oil company to the pipe-line company extended to its agents and employees where the oil company

directed an employee to procure for it certain materials to be hauled and transported over the way. Under such circumstances the rule that one who invites another to come on his premises for a lawful purpose is liable to such invitee for any injury he may receive by reason of the unsafe condition of the premises applies and renders liable the oil company for an injury to an employee of the pipe-line company caused by the breaking of a pipe due to the high pressure of the gas. The invitation implied that the premises would be reasonably safe, at least for the purpose of obtaining and removing the materials, and the person employed and injured had a right to consider that the road would be reasonably safe for travel.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 34.

EMPLOYER'S KNOWLEDGE OF DEFECTS—TIME FOR REPAIR—APPLICATION OF RULE.

The rule that an employer, on learning of the defects of an appliance, must have time to repair the defects does not apply where an employee called the attention of the foreman to the defect and where the foreman assured the employee that the appliance was safe and ordered him to continue its use.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 Southwestern 590, p. 592.

OPERATOR'S PROMISE TO REPAIR.

PROMISE TO REMOVE CAUSE OF DANGER.

The rule that a miner does not assume the risks resulting from the operator's negligence, if known to him, does not apply, and the operator is not relieved from liability where the miner continues in the employment, though subject to extraordinary risks caused by the mine operator's negligence, where the operator promised that the cause of such extraordinary risk will be removed.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

DUTY TO WARN OR INSTRUCT.

COMPETENCY OF EMPLOYEE—WARNING EXCUSED.

A mine operator has a right to rely upon a certified miner's knowledge of the method and the danger of charging and firing blast holes in a mine where the certified miner owned his own tools, had fired thousands of blasts before the accident, and was familiar with the danger of tamping a cartridge with a steel tamping bar and where the accident that caused the injury was an unusual and, in fact, an unheard of accident. Under such circumstances a mine operator can

not be charged with negligence for failing to instruct or warn the miner, as the particular accident could not have been warned against because no one had ever heard of such a thing happening. Negligence of a mine operator can not be predicated on lack of a warning to a miner as to a particular matter that has never come within either the experience or observation of a mine operator or of a miner.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 435.

INCOMPETENCY OF MINER—PRESUMPTION OF LAW.

In an action for damages for the death of a miner caused by an explosion produced by the miner attempting to light a safety lamp it was error for the court to instruct the jury to the effect that the presumption of law in such a case is that the miner, at the time he accepted employment as a brusher was a competent person to fill such a position, where there was evidence tending to show that the miner was not a competent brusher at the time he accepted employment and that the mine foreman knew this fact and was having him coached under the directions of another employee.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 551.

SKILLED EMPLOYEE PRESUMED TO KNOW DANGERS.

An employee who holds himself out as skilled in a trade and thereby procures employment can not hold his employer liable for failure to instruct him in a matter he must be assumed to know in order to successfully pursue that trade. This rule is applied to a certified miner under the Pennsylvania mining act who was given a certificate as qualified to be a miner in any anthracite coal mine in the State and who was employed by the mine operator to charge and fire holes for blasting in the mine.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 435.

CERTIFICATE OF COMPETENCY—EFFECT ON DUTY TO WARN.

A miner, a foreigner only a short time in this country and unable to speak the English language, obtained a certificate from the Miners' Examining Board of Illinois that he had given satisfactory evidence that he had worked in coal mines at the face for not less than two years and was thereby authorized to seek and accept employment as a coal miner. He was not a short firer and had never used explosives in mining operations. In an action by such miner for damages for injuries occasioned by an explosion of powder used in mining, under a charge of common-law negligence, his certificate

of competency received from the miners' examining board was proper evidence on the question as to whether the mine operator knew or would have known by the use of ordinary care, that a miner holding such a certificate was ignorant as to the use of explosives and required instruction and warning in the proper manner of doing his work.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 437.

PROOF OF CUSTOM NOT TO INSTRUCT CERTIFIED MINERS.

In an action by a miner for damages for injuries caused by an explosion of powder at the face of the coal where the miner was working, under a charge of common-law negligence, the negligence of the mine operator in failing to warn or instruct the injured miner, who was a certified miner under the statute of Illinois, it was proper for the mine operator to prove a custom in the mine and in the mines in the mining district and in the county and the adjoining counties to the effect that at no time were practical, certified miners instructed in reference to the manner in which he should place, load, drill, tamp, and fire shots at his working place in the mine, nor was a certified miner instructed how to place his shots, drill his hole, make his cartridge, tamp the cartridge, place the fuse or squib, and light and fire the same. If the custom was general, uniform, and well known not to give further instructions to a certified miner, the custom was not obviously unreasonable or dangerous.

Wendzinski v. Madison Coal Co. (Illinois), 118 Northeastern 435, p. 437.

DANGERS READILY OBSERVABLE.

An employer is not bound to warn an employee of dangers so patent as to be readily observed by the reasonable use of the senses, considering the age, intelligence, and experience of the observer.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 434.

UNEXPLODED SHOTS—WARNING.

It is the duty of a mine operator to warn or instruct newly employed or inexperienced miners of the danger of injury from unexploded shots remaining in the coal and which it was the duty of an inexperienced miner to take out and especially where the mine operator had knowledge of the danger and had adopted a stringent rule in reference thereto prohibiting the miners from working where there was an unexploded shot.

Jellick v. Jamison Coal & Coke Co. (Pennsylvania), 103 Atlantic 300, p. 301.

DUTY AS TO UNEXPLODED SHOTS.**DEGREE OF CARE REQUIRED.**

A charge of dynamite or other explosive placed in the coal and fired by the use of an electric battery seldom fails to explode, but when one does misfire, the miner is not expected or permitted to deal with the situation, but is required to report the circumstances and the matter is then turned over to one skilled in the use of explosives. It is the duty of a mine operator on directing a miner to pick down the coal following a shot to warn or instruct him as to the danger, and to inform him of a rule of the operator made for his protection.

Jellick v. Jamison Coal & Coke Co. (Pennsylvania), 103 Atlantic 300, p. 301.

UNEXPLODED SHOTS—SAFE PLACE.

A miner while sinking a shaft was injured by an explosion of dynamite in a misfire hole resulting from the failure of a prior shift of miners to explode all the charges of dynamite placed in the drill holes. If the shaft was not a reasonably safe place at the time the miner was injured it was because of the misfire hole; and it was a reasonably safe place to work unless such misfire hole resulted from the use of an improper fuse. If a proper fuse was used and there yet occurred a misfire that rendered the shaft less safe, such increased unsafety would be merely an incident to a properly conducted mining business and the shaft would still be a reasonably safe one. Whether or not a place in which miners are required to work is a reasonably safe one depends not upon its actual freedom from danger but upon whether the mine operator has used all proper precautions looking to making and keeping such place as safe as the nature of the business will reasonably permit.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147.

DUTY OF OPERATOR TO WARN OR INSTRUCT MINERS.

A mine operator carrying on a business involving danger to his employees and with knowledge of the possibility of special danger from unexploded shots, adopted a special rule for the conduct of miners to guard them against injury from that source. The operator was therefore bound to instruct the miners clearly and unequivocally with respect to that danger and as to the means of avoiding it. The stringency of the rule adopted for the guidance of the miners in dealing with unexploded charges when they were discovered shows that the mine operator fully appreciated the fact of possible danger from that cause.

Jellick v. Jamison Coal & Coke Co. (Pennsylvania), 103 Atlantic 300, p. 301.

BLASTING—USING POOR FUSES—INCREASED RISK—BURDEN OF PROOF.

A miner assisting in sinking a shaft was injured by the explosion of a charge of dynamite remaining in a misfire hole that resulted from the failure of a prior shift of miners to explode all the charges of dynamite in the drill holes. The negligence charged consisted in the use of a poor or defective fuse. If an improper fuse was furnished to the former shift and used when attempting to fire the charge and if the misfiring of the charge was traceable to the use of the improper fuse, then the burden was on the mine operator to show that he was not guilty of negligence under the rule that when an employer negligently increases a known risk and an injury occurs the burden rests upon the mine operator to show that the injury did not occur because of that which increased the risk.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147.

RULES—ADOPTION AND PROMULGATION.**MINER'S KNOWLEDGE OF RULES—PRESUMPTION.**

When rules are adopted, approved, and posted by a mine operator as required by the statute, the miners are deemed to have notice of and to have agreed to the same; and a miner can not complain that he had no notice or knowledge of a rule where he failed to request that it be furnished him.

Elk Horn Mining Corp. v. Vahoose (Kentucky), 200 Southwestern 921, p. 923.

VIOLATION OF RULE BY MINER.

A miner who violates a rule adopted and posted by the mine operator as required by the statute can not recover for injuries occasioned by such violation.

Elk Horn Mining Corp. v. Vahoose (Kentucky), 200 Southwestern 921, p. 923.

DUTY TO INFORM MINER OF RULE.

It is the duty of a mine operator who has adopted a stringent rule in reference to miners working about unexploded shots to inform a newly employed and inexperienced miner fully of the rule and its requirements and of the danger of the work where shots remained.

Jellick v. Jamison Coal & Coke Co. (Pennsylvania), 103 Atlantic 300, p. 301.

PROOF OF EXISTENCE OF RULES.

A mine operator can not be charged with negligence and held liable for injuries to a miner caused by the premature explosion of a blast on the ground that the mine operator had failed to post rules and

regulations as required by the statute, where the injury complained of was not the proximate result of the violation of any rule and where the injured miner testified that he had never seen the rules posted and where other uncontradicted evidence showed that rules were in fact posted in various places.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 435.

DELEGATION OF DUTY.

LIABILITY FOR NEGLIGENCE.

Where a mine operator instead of personally performing the duties imposed upon him as employer engages another to perform these duties for him, he is liable for the negligence of such person so engaged. The negligence of the person thus acting is not the negligence of a fellow servant, no matter what his position as to other matters is, but is the negligence of the mine operator to do those things which it is his duty to perform.

Federal Mining & Smelting Co. v. Anderson, 247 Federal 472, p. 474.

NEGLECT OF FOREMAN OR OFFICER.

NEGLIGENT ORDER.

A foreman's negligence, sufficient to make the mine operator liable, may consist in negligently ordering an employee to continue the use of a defective appliance.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 Southwestern 590, p. 592.
Consolidated Coal Co. v. Deskins (Kentucky), 199 Southwestern 799.

LIABILITY OF OPERATOR FOR NEGLIGENCE.

A mine operator who delegates to older and experienced employees the duty of instructing and qualifying the inexperienced miners for service, is liable for the negligence or omission of any such instructor if, by reason of it, the employee or miner suffers injury.

Jellick v. Jamison Coal & Coke Co. (Pennsylvania), 103 Atlantic 300, p. 301.

NEGLECT OF FELLOW SERVANT.

GROSS NEGLIGENCE AND WILLFUL ACT.

In an action by a miner for damages caused by the alleged gross negligence of a fellow servant, it is error for a court in its instructions to the jury to make the mine operator's liability depend upon willful rather than gross negligence of the fellow servant.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

GROSS NEGLIGENCE OF SUPERIOR FELLOW SERVANT.

Under the rule as applied in Kentucky a miner may recover from the mine operator damages for injuries caused by the gross negligence of a fellow servant; and particularly so where the fellow servant is superior and is authorized to give orders to the miner.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

NEGLIGENCE OF MOTORMAN—LIABILITY OF OPERATOR.

A coal mine operator may be liable for the negligence of a motorman in running and operating the motor in such a careless and negligent manner and with such rapidity in backing out of a siding with the trolley pole in front of the motor that caused the wheel to jump from the wire at the fork, the pole to strike against the roof of the entry, breaking it and causing an injury to the brakeman on the motor by coming in contact with the live wire.

Borderland Coal Co. v. Miller (Kentucky), 201 Southwestern 299, p. 301.

MINER'S WORKING PLACE—SAFE PLACE.**DUTY OF MINER TO KEEP SAFE.**

A mine operator is not subject to the charge of negligence and consequent liability for the death of a miner caused by an explosion of gas in a room where the miner himself was employed for the purpose of brushing the gas out of the room and where he was competent to perform that duty.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 Southern 547, p. 551.

MINER MAKING WORKING PLACE.

The common law rule that requires a master to exercise ordinary care to provide his servant a reasonably safe place in which to work does not apply in cases in which the very work the servant is employed to do is of such a nature that its progress results in constant changes in the condition of the place affecting its safety.

J. Woolley Coal Co. v. Tevault (Indiana); 118 Northeastern 921, p. 925.

MINER MAKING WORKING PLACE SAFE.

A mine operator must timber his mine and use ordinary care to keep it reasonably safe for the use of his miners, but he must have men to timber it up. A mine operator when he sends in a set of men to timber up the mine is not required first to send in another set of men to make the mine safe for them. Miners engaged in such

work must understand that they are putting in the timbers to make the mine safe.

Charles v. Elk Horn Mining Co. (Kentucky), 200 Southwestern 461.

MINER MAKING WORKING PLACE—CHANGING CONDITIONS.

A miner assisting as a shoveler in the operations of an electrical mining machine was injured by a fall of rock or slate from the roof on the removal of a jack by the jack setter. At the time the jack was set the roof at the place appeared safe and sound. The operations of the heavy cutting machine were sufficient to jar and loosen the roof. If the place was reasonably safe when the jack was set, the subsequent unsafe condition might have been brought about by the very work in which the injured miner, with others, was engaged and under such conditions the miners themselves are charged with keeping the working place safe.

Haggard v McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1075.

INSPECTION OF ROOF BY MINER—PRESUMPTION OF DUTY.

In an action by a miner—a shoveler, assisting in the operation of an electrical coal-cutting machine—for damages for injuries resulting from a fall of slate from the roof, it was charged that the jack setter, a miner assisting in the operation of the machine, and whose duty it was to set the jack, negligently failed to inspect the roof when he set a jack in advance of the machine. The complainant on the trial of the case offered no proof whatever to show that the jack setter did not inspect the roof. In the absence of such proof and under the law the jack setter is presumed to have done his duty in the matter of the inspection of the roof and the setting of the jack.

Haggard v. McGrew Coal Co. (Missouri), 200 Southwestern 1072, p. 1074.

RULE REQUIRING MINERS TO EXAMINE WORKING PLACE.

A rule of a mine operator required that each miner must ascertain by careful examination that the particular place in which he was employed was safe. If found to be unsafe, measures must be taken to remove the danger and before proceeding to work, if necessary, the foreman or shift boss, must be notified. Such a rule can not operate to prevent an injured miner from recovery on the ground that he, and not the shift boss, should determine the safety of his working place. The rule itself vests the shift boss with general supervisory authority over the matter of making the working places safe. In an action by a miner for injuries received by a fall of rock it appeared that the miner attempted to make his working place safe and that the shift boss intervened and told him that an examination had been

made and that the place was safe, and peremptorily ordered the miner to proceed to work. In doing this the shift boss exercised authority given by the rule, and he had authority ultimately to determine the question of the safety of a working place.

Federal Mining & Smelting Co. v. Anderson, 247 Federal 472, p. 474.

DUTY OF INSPECTION—ASSURANCE OF SAFETY.

A miner was employed as a laborer in a mine and immediately put to work loading coal taken from a room neck, which was being driven from the main entry in the mine, where the coal had been shot down ready to be loaded into the cars. While so engaged a piece of slate fell from the roof, injuring the miner, and for which a suit was brought for damages. There was nothing to show that it was the duty of the miner or the other shovelers working with him to inspect or make safe the particular place in which they worked; but it appeared from the evidence that the mine boss assured the miner that the place was safe and directed him to work at the particular place.

Carter Fuel Co. v. Fillipeck (Kentucky), 201 Southwestern 468, p. 469.

APPLICATION OF SAFE-PLACE DOCTRINE TO OPERATOR OF DRILLING MACHINE.

The operator of a drilling machine in a mine was charged with the duty of inspecting and making reasonably safe the place where he was working. He had nothing to do with inspecting any other portion of the mine or making it safe, but as to the particular place of his work he absolved the mine operator from the duty of making the place safe, but he did not do so with respect to any other part of the mine. Under such circumstances the mine operator is liable for negligently permitting the roof of the mine to become unsafe, by reason of which the operator of the drilling machine was injured from rock falling from the roof of the mine in a place other than the immediate place of his work.

Ulrich v. Utah Apex Mining Co. (Utah), 169 Pacific 268, p. 264.

DANGEROUS INSTRUMENTALITIES FURNISHED BY OPERATOR—NEGLIGENCE IMPLIED.

The rule that the happening of an accident resulting in injury to an employee furnishes no basis for an inference of negligence does not apply where the dangerous instrumentality causing the injury was exclusively in the control of the mine operator. Under such circumstances the happening of the accident raises a presumption of negligence on the part of the mine operator and casts upon him the

burden of showing that he was without fault. The happening of the accident by reason of the employment of the instrumentalities implies negligence on the part of a mine operator, and in the absence of some explanation on his part showing that he was without fault a case is made sufficient to justify an award of damages to the injured employee.

Barry v. Badger (Montana), 169 Pacific 34, p. 36.

CONTRIBUTORY NEGLIGENCE OF MINER.

COURT MAY DECIDE AS A MATTER OF LAW.

In an action by a car driver for damages for injuries sustained on the ground of the alleged negligence of the mine operator in furnishing him vicious and unruly mules to drive and in failing to maintain a sufficient space between the car and the side of the entry, the court on hearing the evidence may determine as a matter of law that the negligence alleged was not the proximate cause of the injuries, but that the injuries were caused by the driver's own negligence.

Mayhan Jellico Coal Co. v. Bird (Kentucky), 201 Southwestern 306, p. 307.

PLEADING—FREEDOM FROM—BURDEN OF PROOF.

The fact that an employee, injured by a defective appliance, alleges in his complaint for damages that he did not contribute to the injury by his negligence does not cast the burden on him of maintaining such unnecessary allegation.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 Southwestern 590, p. 592.

QUESTION OF FACT.

An assistant to a mine engineer making measurements along the mine track was directed to wait a few minutes at a place on the track near the end and in front of a car. The car was loaded with coal at the top on an incline and was held in position by a prop braced against the front corner of the car and against a tie in the track. The engineer in returning to the place where his assistant was directed to remain stumbled against the prop, causing it to fall and permitting the car to start down the grade, inflicting the injuries upon the assistant for which he sued. The place where the injured miner was directed to wait and where he did remain was neither necessarily nor obviously dangerous, and while waiting at the place he was talking to the mine foreman, who was also either sitting or standing at the front end of the car. Whether or not the injured miner was guilty of contributory negligence under the circumstances was a question of fact to be determined by the jury.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

WHEN AVAILABLE AS A DEFENSE.

In an action by a miner for damages for injuries occasioned by an explosion of powder at the face of the coal, where the miner was engaged at work, the miner's contributory negligence is available to the mine manager, who was made a party and attempted to be held jointly liable with the mine operator, a corporation that had elected to reject the workmen's compensation act of Illinois, and where there was a general charge of common-law negligence.

Wendzinski v. Madison Coal Co. (Illinois), 118 *Northeastern* 435, p. 437.

THEORY OF DEFENSE.

Contributory negligence, where it is effective as a defense, is based on the fact that the employee's manner of meeting the inherent or apparent hazards in the employment was not consistent with reasonable care.

J. Woolley Coal Co. v. Tevault (Indiana), 118 *Northeastern* 921, p. 924.

PROXIMATE CAUSE OF MINER'S DEATH DEFEATS RECOVERY.

An instruction in an action for the death of a miner caused by an explosion is not reversible error where it instructed a finding for the defendant, if the jury found the existence of the contributory negligence as pleaded, and that it was the proximate cause of the injury and death, notwithstanding the defendant's servants may have been guilty of negligence.

Alverson v. Little Cahaba Coal Co. (Alabama), 77 *Southern* 547, p. 551.

KNOWLEDGE OF DEFECTIVE APPLIANCES.

The fact that an employee knew that an appliance was in a way defective does not charge him with knowledge that it would be negligence to use it, especially where he was assured by the mine foreman that the appliance was safe and was ordered to continue its use.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 *Southwestern* 590, p. 592.

KNOWLEDGE OF DEFECTIVE APPLIANCES—OBEYING ORDERS.

An employee believing an appliance to be defective, called the attention of the foreman to the defect in the appliance and is subsequently injured while using the appliance and because of the defect, is not to be charged with contributory negligence and his action for damages defeated on the ground of contributory negligence as a matter of law, where it appears that the employee was assured by the foreman that the appliance was safe and was at the time ordered to continue the use of the appliance.

Morgan v. Sunflower Zinc Co. (Mo. App.), 199 *Southwestern* 590, p. 592.

KNOWLEDGE OF DANGER—NEGLIGENCE OF FELLOW SERVANT.

A brakeman on a mine motor whose duty it was to handle and change the trolley pole from the front to the rear of the motor so that the trolley pole would follow rather than precede is not to be charged with contributory negligence because he knew that there was more danger in running the motor with the trolley pole in front than behind, where it was customary to run the motor the short distance off of a siding back on to the main track and where it was not regarded as dangerous when the motor was properly operated by the motorman.

Borderland Coal Co. v. Miller (Kentucky), 201 Southwestern 299, p. 301.

WANT OF KNOWLEDGE OF DANGER.

A miner employed as a laborer and directed to work in the neck of an entry loading coal into cars can not be charged with contributory negligence to defeat an action for injuries received by a fall of rock from the roof, on the ground that he chose a dangerous rather than a safe place in which to perform his work, where he had never before worked in the mine, knew nothing of the formation or of the condition of the roof, and was on his employment immediately directed to the place to work and was assured by the mine boss that the place was safe.

Carter Fuel Co. v. Fillpeck (Kentucky), 201 Southwestern 468, p. 469.

DANGERS NOT OBVIOUS.

A miner is not to be charged with contributory negligence where he was working at the point he was directed to work by the mine superintendent and where his attention was not called to the fact that it was unsafe for him to work at a certain place alongside a conveyor in the mine on account of the fact that the wheels were not protected as at other places and on account of the fact that twentypenny nails were used to hold the wheels of the conveyor in place instead of cotter pins in the original construction. The lack of safety inhering in the machinery as primarily constructed and the dangers resulting from a failure to maintain the protecting case were not obvious to the miner.

Sloss-Sheffield Steel & Iron Co. v. Russel, 247 Federal 289, p. 291.

CUSTOMARY MODE OF OPERATING TROLLEY POLE.

A brakeman on an electric motor in a mine is not to be charged with contributory negligence in failing to change the trolley pole from the front to the rear of the motor while the motor was backing

out of a siding to get back on the main track, where it was customary to permit the trolley to remain in front of the motor for such short distances, and where it was not regarded as dangerous when the motor was carefully and properly operated.

Borderland Coal Co. v. Miller (Kentucky), 201 Southwestern 299, p. 301.

EMPLOYEE WORKING OUTSIDE SCOPE OF DUTIES.

A laborer was employed by a coal mining company in caring for a substation and the machinery and appliances therein, owned and operated by the coal company and used by it in supplying electricity for the operation of its mine. There were 22,000 volts of electricity passing through the switches for the use of the coal mining company, and it was not practical or possible to insulate wires carrying such high voltage. The switches for turning on and off the current were operated by means of wooden poles, some 6 feet in length, and there was no danger in so operating them. It was no part of the laborer's duty to repair the switches; but it was his duty when a fuse burned out of the end of a stick, to remove the stick, put a fuse therein and replace the switch stick, and this work was not attended with danger. On the occasion of the accident the laborer was directed by the general manager of the coal company by telephone to pull the switches and notify the miners to come out of the mine, as there would be no more power. Upon receiving such directions the laborer pulled the switch sticks and thereupon procured a ladder, placed it against the wall near one of the switches, climbed up to an iron pipe about 12 feet from the floor, and there came in contact with the pipe and the switch or wire and was thereby killed. Under such circumstances there can be no recovery for the death of the laborer, as the direct and proximate cause of his death was his own negligence in voluntarily and outside of the line and scope of his duties going into a place of danger and in disregard of express instructions.

Caulkins v. Wyoming Coal Mining Co. (Wyoming), 171 Pacific 265, p. 266.

DECLARATIONS OF DECEASED MINER—PROOF.

The declarations of a deceased person when a part of the *res gestae* are admissible whether they are in favor of or against the interests of the estate of the deceased. When the declaration is not a part of the *res gestae*, it is admissible if it is against the interest of the declarant, but not when it is in his favor. Dying declarations as such are not admissible *per se* in civil cases, but are governed by the general rule of admitting declarations against interest. Under these rules the declaration of a deceased miner made after the injury and before his death tending to show that he was guilty of

work and furnished his own tools and was the only kind of a person lawfully authorized to do the work he was doing. He had been accustomed to this labor for years and if sparks may be produced from damp rock from a blow by a steel tamper he had had every opportunity of learning the truth about the matter, larger than that of all except other miners. Knowledge of such dangers was part of his equipment for work and to ascertain and remember the fact required nothing but ordinary judgment and common observance.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 434.

KNOWLEDGE OF OPERATOR'S NEGLIGENCE.

A miner will be regarded as having assumed such risks as result from his employer's negligence if he had or ought to have obtained knowledge of such risk before his injury was received.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

NEGLIGENCE OF MINE OPERATOR—WHAT INCLUDED.

When referring to a mine operator's negligence in connection with the rules pertaining to assumption of risk there is included in the term "negligence" any and every failure of the mine operator to fulfill his obligation to provide for his miners' safety.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

DANGERS FROM UNEXPLODED SHOTS—MINER'S KNOWLEDGE.

A miner assisting in sinking a shaft and injured by an explosion of a charge of dynamite in a misfire hole resulting from the failure of a prior shift of miners to explode all the charges placed in the hole assumed the risk of the explosion where it appeared that he was an experienced miner; that the shaft in which he had been and was working was a very wet one, and that in such shafts there are more misfire holes than in dry shafts, and that in this particular shaft there was a greater per cent of misfire holes than he had ever known in other shafts; that he did not know of any shifts but that had left misfire holes; that he did not know the kind of fuse used in the misfire holes; but he did not consider the fuses used of the best quality, and so informed the superintendent; that he was advised that the former shift reported that there were two misfire holes, but the particular location of the misfire holes could not be given; that he made all possible effort to find the misfire holes but failed and concluded there were no such holes. Being fully advised as to the risks, it is immaterial whether he knew the causes and also immaterial as to whether those risks were brought about by negligence on the part of the mine

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operator. It can not be said that because the miner concluded that there was no misfire hole that he did not comprehend the risk.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

RISKS NOT ASSUMED.

DANGERS RESULTING FROM OPERATOR'S NEGLIGENCE.

A miner assumes no risk from dangers resulting from the mine operator's negligence.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

An employee never assumes the risk of danger due to the employer's negligence.

Staggs v. Gotham Mining & Milling Co. (Mo. App.), 199 Southwestern 717, p. 719.

NEGLIGENCE OF SHIFT BOSS.

A miner working in a mine and injured by a fall of rock does not assume the risk or dangers incident to his working place, where the shift boss had the authority to direct the miner to work in the particular place and informed him that he had inspected the rock and that the place was safe.

Federal Mining & Smelting Co. v. Anderson, 247 Federal 472, p. 473.

DANGERS OUTSIDE OF WORKING PLACE.

The operator of a drilling machine in a mine does not assume the risk or dangers and consequent injury in parts of the mine other than at his particular place of work.

Urich v. Utah Apex Mining Co. (Utah), 169 Pacific 263, p. 264.

SCOPE OF EMPLOYMENT.

MINER WAITING UNDER DIRECTIONS OF SUPERIOR.

A miner assisting a mine engineer in making measurement on and along the mine track was directed by the engineer to wait at a particular place on the track, until he made some measurements a short distance away. While so waiting, and through the carelessness of the mine foreman or boss, a loaded car against which the miner was standing or sitting was released, started down the incline, and injured the waiting miner. Under such circumstances the miner while waiting at the command of the mine engineer was engaged in the line of his employment at the time of the accident.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

PROXIMATE CAUSE OF INJURY.**PROXIMATE CAUSE DEFINED.**

An act is the proximate cause of an event which in the natural order of things and under the particular circumstances surrounding it such an act would necessarily produce that event. The practical construction of proximate cause by a court is a cause from which a man of ordinary experience and sagacity could foresee that the result might probably ensue; but the law goes no further back than to find an active, efficient, and procuring cause of which the event under consideration is a natural consequence.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 50.

QUESTION OF FACT.

A mine operator, by his foreman, directed a miner to hold an unguarded insulator attached to a live wire while other employees attached the wire to a pole some distance away. While in the act of attaching the wire, the employees by jerking it caused the miner's hand to come in contact with the live wire, causing the injury complained of. Whether or not the negligence of the mine operator in furnishing the miner an unguarded insulator without releasing the live wire was the proximate cause of the injury, was a question of fact to be determined by the jury.

Elk Horn Mining Corp. v. Pitts (Kentucky), 201 Southwestern 9, p. 10.

METHODS OF DETERMINING.

In determining what is the proximate cause of an injury it is proper to inquire and ascertain whether the injury is a natural and probable consequence of the negligent act; or, if it is such a consequence as under the surrounding circumstances of the case might and ought to have been foreseen by a reasonably prudent person in the exercise of ordinary care, as likely to result from the act complained of.

Loveless v. Cunard Mining Co. (Mo. App.), 201 Southwestern 375, p. 379.

NEGLIGENCE OF OPERATOR.

The negligence of a mine operator to render him liable for an injury to a miner must be the proximate cause of the injury, and a connection between the act or omission and the resulting injury must be shown. As a matter of pleading a complaint is insufficient if it fails to show a connection between the alleged negligence of the mine operator and the injury to the miner, or where the contrary

appears from the other allegations in the pleading. No particular form of allegation is necessary and, where the negligent act causing the injury is set out with the allegation that by reason of, by, through, or in consequence of such negligence the miner was injured, it is equivalent to an allegation that the operator's negligence caused the injury or that the injury was wholly caused thereby.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 49.

NEGLECTENCE OF EMPLOYER—CARE EXERCISED BY EMPLOYEE.

In an action by an injured miner under the Indiana employer's liability act of 1911 to recover for injuries sustained during the course of his employment, he is entitled to recover if the jury determines: (1) that negligence on the part of the mine operator, or those for whose acts he is responsible, proximately contributed to the injury complained of; and (2) that the miner's conduct in the face of the hazard which resulted from such negligence was characterized by the exercise of due care for his own safety.

J. Woolley Coal Co. v. Tevault (Indiana), 118 Northeastern 921, p. 926.

NEGLECTENCE OF OPERATOR OR OF FELLOW SERVANT.

In an action by a miner for damages for injuries caused by a car loaded with coal running upon and against him the jury should be instructed as to the meaning of proximate cause and left to determine whether the proximate cause of the injury complained of was the negligence of the mine operator in insecurely propping the coal car on an incline, or whether it was the negligence of a fellow servant in brushing or stumbling against the prop, knocking it down and releasing the car.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

NEGLECTENCE OF MINER—PLEADING.

The fact that an injured miner alleges in his complaint that his injuries were proximately caused by the negligence of the mine operator, yet if it appear from the facts pleaded that the negligence of the mine operator as alleged had no casual connection with the miner's injuries, or if the injuries were proximately caused by some other agency, or by the act of the injured miner himself, the complaint as a matter of pleading would not be sufficient.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 49.

FAILURE TO FURNISH PROPS—MISTAKEN JUDGMENT OF MINER.

A coal mine operator may be liable for injuries to a miner caused by a fall of rock because of the failure of the operator to furnish

props if such failure was the proximate cause of the injury. Such failure is not excused and consequent liability avoided because the miner was mistaken in his judgment and believed that the rock would not fall if he continued his work.

Western Coal & Mining Co. v. Watts (Arkansas), 199 Southwestern 921, p. 923.

INTERVENING AGENCY.

As a general rule a mine operator although guilty of a negligent act that would not have produced the injury complained of but for the subsequent intervening negligence of another, will not be responsible for damages resulting from the injury. The test of whether the act complained of was the proximate or remote cause of the injury is to be found in the probability of injurious consequences which were to be anticipated, and not in the number of subsequent events and agencies that might arise.

Corrigan v. Oklahoma Coal Co. (Oklahoma), 171 Pacific 47, p. 49.

FORMER APPEAL—LAW OF CASE.

On appeal in an action by a miner for damages caused by the alleged negligence of the mine operator it was held that as a matter of law the alleged negligence of the mine operator was not the proximate cause of the injuries complained of. This holding of the law must follow the case through all its subsequent stages and must be the guiding rule on a subsequent trial where the evidence on the subject is substantially the same as on the former trial.

Mayhan Jellico Coal Co. v. Bird (Kentucky), 201 Southwestern 306.

CONTRACTS RELATING TO OPERATIONS.

DUTY TO CONTRACTEE—LIABILITY FOR INJURIES.

A miner employed by a coal mine operator under a contract by which he was to receive so much per ton for shooting and loading coal, after the company had mined it, the miner furnishing labor, powder, fuses, and tools, and the mine operator furnishing the timber, cars, and rails, the miner having full charge and control of the mine where he worked and entirely responsible therefor, is not an employee of the mine operator but a contractor and stands in the relation of an invitee upon the mine operator's premises and to whom the mine operator owes the duty of ordinary care and prudence as to his safety.

Benoit Coal Mining Co. v. Faught (Alabama), 77 Southern 695.

INDEPENDENT CONTRACTOR.**LIABILITY OF OPERATOR FOR INJURIES TO.**

A complaint in an action against a coal mine operator for damages alleged that the complainant had a contract with the operator to mine coal in his mine at a stated price per ton; that under the contract it was the duty of the mine operator to furnish all materials, including cars, rails, and the men to operate the cars, and the complainant mined and loaded the coal; that the mine operator used mining cars operated by electricity; that while the complainant was engaged in the discharge of his duty under his contract and was in the lawful use of the entries in the mine necessary and proper in the discharge of his duties, the defendant's agents and employee, while engaged in the discharge of their duties, negligently allowed the coal cars to run along and over the tracks in the entry where the complainant was discharging his duties and upon or near where the complainant was at work; and that an iron or steel rail or bar which was then being carried on one of such cars struck the complainant; and that such rail or bar was thereby driven through his person in the region of his hips or thighs causing the injury complained of. As shown by these averments the complainant stood in the relation of an invitee upon the mine operator's premises as a contractor and to whom the mine operator owed the duty of ordinary care and prudence as to his safety. The complaint stated a good cause of action for damages.

Benolt Coal Mining Co. v. Faught (Alabama), 77 Southern 695.

METHODS OF OPERATING.**FIRST-CLASS MINING—MEANING.**

A coal mining company owning a small tract of coal land on the State line procured a lease from the owner of a large tract of coal lands in the State of Missouri. By the terms of the lease the mining company, the lessee, undertook to mine, raise to the surface, and remove all the minable coal in the Missouri tract that could be dug or mined under the rules of first-class mining prevailing in the Southern Kansas District. It must be presumed under the lease that the Kansas mining company was well acquainted with the nature and conditions of the work it was engaged to perform, the mineral character of the land upon which it was to be practiced, and the rules of first-class mining prevailing in the Southern Kansas District. In the absence of any reference to such rules it will be presumed that they mean good, safe mining with respect to the conservation of the product, the protection of the miners and the pre-

vention of injury to the surface, all of which will be implied if not expressed.

Union Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 234.

OPERATION OF OIL REFINERY—LAWFUL BUSINESS—LIABILITY.

A complaint by a land owner against the owner and operator of an oil refinery demanded damages for injuries to his land because of large quantities of oil, refuse, and poisonous substances permitted to escape from the refinery and run upon and over his land producing the injuries complained of. There was no allegation of any unnecessary act of the owner of the refinery in the construction or operation of the same and no averment that in its operation the owner was guilty of any negligent act or omission. Such an action is not based upon negligence but upon the maintenance of a nuisance. An owner of property, although conducting a lawful business, is subject to reasonable limitations. He must use his property so as not unreasonably to interfere with the health or comfort of his neighbors or to their right to the enjoyment of their property. If he makes an unreasonable or unlawful use of it, so as to produce material injury or great annoyance, he will be guilty of a nuisance and will be liable for the consequent damages. It is not necessary that the use to which the property is put shall be unlawful in itself in order to constitute a nuisance in the eyes of the law, nor will the fact that the business is carried on carefully and in accordance with reasonable methods employed in such business relieve the owner of liability to another if the use is unreasonable and such as constitutes a nuisance.

* Helms v. Eastern Kansas Oil Co. (Kansas), 169 Pacific 208, p. 209.

BREACH OF CONTRACT TO DEEPEN WELL—LOSS OF PROFITS AS DAMAGES.

A party contracting to deepen an oil well at a certain specified sum per foot and who was prevented from completing the work by the wrongful refusal of the contractor to furnish material as agreed upon, is not limited, in an action for damages for the breach of the contract, to a loss of prospective profits and the amount of profits lost under such circumstances is not the sole measure of damages, and while he may, under proper pleading and proof, recover for a loss of prospective profits, he is not limited to this recovery but may recover for the amount expended and for the value of his own services.

Blair v. Brownstone Oil & Refining Co. (Cal. App.), 170 Pacific 160.

COMMON AGENCY—LIABILITY OF JOINT USERS.

An oil company owned and maintained a pipe line laid upon the surface of the ground. A gas company used the pipe line as one of

its agencies in supplying gas to the oil company, the owner of the pipe line, and to other customers along the line. The pipe line was one of the instrumentalities used by the gas company and it was under a duty to see that this instrumentality was in a reasonably safe condition before it began the use of it for the purpose of furnishing gas to its customers and thereafter to see that the line was maintained in a reasonably safe condition. Persons using a common agency in the conduct of their business may be equally liable to a third person injured by the negligent and careless construction and maintenance of such agency though the agency itself is owned by one of the parties only.

Starcher v. South Penn Oil Co. (West Virginia), 95 Southeastern 28, p. 35.

MINING AND SHIPPING COAL—STABILITY OF INDUSTRIES.

The mining, transportation, and sale of coal, considered as a whole, has acquired under normal conditions qualities, characteristics, developed principles, and has brought into existence conditions that can not be instantly altered for the convenience of persons desiring the temporary introduction and maintenance of new qualities, principles, methods, and conditions without a disastrous dislocation and disturbance of those previously fixed and settled by long experience, vast expenditures of money and exercise of the highest degree of skill and efficiency. Mining and coal transportation are closely allied industries, mines are opened and equipped with reference to railroads, and railroads built, equipped, and operated with reference to the mines and coal markets and terminal requirements and facilities.

Baltimore & Ohio R. R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 547.

RIGHT TO SURFACE SUPPORT.

LIABILITY—PROOF OF DAMAGES.

In an action by the surface owner for damages for the subsidence of the surface caused by the mining operations a recovery is justified where the evidence tended to show that the surface of the land had subsided in 250 or 260 different places within two years prior to the commencement of the action and where the evidence tended to show the decrease in the value of the surface of the land caused by the subsidence of the surface.

Walsh v. Kansas Fuel Co. (Kansas), 169 Pacific 219, p. 220.

LIABILITY FOR SUBSIDENCE OF SURFACE—STATUTE OF LIMITATIONS.

An action for damages by a land owner against a mine operator for damages caused by the subsidence of the surface of land brought

about by mining coal therefrom, is not barred by the statute of limitations until two years have elapsed after the surface has subsided. Such an action does not accrue and the statute does not begin to run until the land has subsided.

Walsh v. Kansas Fuel Co. (Kansas), 169 Pacific 219, p. 220.

LABOR ORGANIZATIONS.

RIGHT OF MINE OPERATOR TO EXCLUDE UNION MINERS.

The fact that a coal mine operator endeavored to secure a closed nonunion mine through individual agreements with his miners and employees furnishes no excuse for the employment of coercive measures to secure a closed union mine through an agreement with the union. The mine operator had a legal and constitutional right to exclude union men from employment in his mine. There was no middle ground open to the operator; no option to have an "open shop" employing union men and nonunion men indifferently; it was the union that insisted upon "closed shop" agreements requiring even carpenters employed about the mine to be members of the union and making the employment of any nonunion man a ground for a strike. A mine operator is in the reasonable exercise of his rights in excluding all union men from his employ, where he has learned from previous experience that unless this was done union organizers might gain access to his mine in the guise of laborers.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 73.

RIGHT OF MINE OPERATOR TO LABOR OF MINERS.

A coal-mine operator who in the exercise of his undoubted rights has established a working agreement between himself and his employees, with the free assent of the latter, is entitled to be protected in the enjoyment of the resulting status, the same as in any other legal right. The fact that the employment is "at will" and terminable by either party at any time does not change the rule.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 72.

OPERATOR ENTITLED TO GOOD WILL OF EMPLOYEES.

A coal mine operator is entitled to the good will of his employees, precisely as a merchant is entitled to the good will of his customers, although they are under no obligation to continue to deal with him. The value of this relation lies in the reasonable probability that by properly treating his employees and paying them fair wages and avoiding reasonable grounds of complaint, he will be able to retain

them in his employ and to fill vacancies that may occur by the employment of other men on the same terms. The pecuniary value of such reasonable probabilities is incalculably great and is recognized by law in a variety of relations.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 73.

EMPLOYMENT UNDER AGREEMENT NOT TO JOIN UNION.

A coal mine operator is as free to make nonmembership in a union a condition of employment as a miner is free to join a union, and this is a part of the constitutional rights of personal liberty and private property not to be taken away even by legislation, unless through some proper exercise of the paramount police power. A coal mine operator is acting within his lawful rights in employing miners only upon terms of continuing nonmembership in the "United Mine Workers of America." The rule is particularly applicable, if explanation or justification is needed, where the operator's repeated costly experiences of strikes and other interferences while attempting to run "union" had induced him to run nonunion and to make nonmembership in the union a condition to continued employment.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 73.

PEACEABLE METHODS TO ORGANIZE TRADE UNIONS—INDUCING BREACHES OF CONTRACTS.

Officers and agents of the United Mine Workers of America in no way connected with the operations of a particular mine, but seeking to organize the mine as a union can not assume that all measures that may be resorted to are lawful if they are peaceable and if they stop short of physical violence or coercion through fear of it. On the contrary, any violation of the operator's legal rights contrived by such officers and agents for the purpose of inflicting damages or having that as its necessary effect is as plainly prohibited by the law as if it involved a breach of the peace. A combination to procure concerted breaches of contract by the operator's employees constitutes such a violation.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 74.

INDUCING MINERS TO QUIT EMPLOYMENT.

A right of action for persuading an employee to leave his employer is universally recognized and rests upon fundamental principles of general application, not upon the English statute of laborers, and applies to persons inducing or persuading miners to leave their employers.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 73.

work and furnished his own tools and was the only kind of a person lawfully authorized to do the work he was doing. He had been accustomed to this labor for years and if sparks may be produced from damp rock from a blow by a steel tamper he had had every opportunity of learning the truth about the matter, larger than that of all except other miners. Knowledge of such dangers was part of his equipment for work and to ascertain and remember the fact required nothing but ordinary judgment and common observance.

Lehigh & Wilkesbarre Coal Co. v. Sawickas, 247 Federal 432, p. 434.

KNOWLEDGE OF OPERATOR'S NEGLIGENCE.

A miner will be regarded as having assumed such risks as result from his employer's negligence if he had or ought to have obtained knowledge of such risk before his injury was received.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

NEGLECT OF MINE OPERATOR—WHAT INCLUDED.

When referring to a mine operator's negligence in connection with the rules pertaining to assumption of risk there is included in the term "negligence" any and every failure of the mine operator to fulfill his obligation to provide for his miners' safety.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

DANGERS FROM UNEXPLODED SHOTS—MINER'S KNOWLEDGE.

A miner assisting in sinking a shaft and injured by an explosion of a charge of dynamite in a misfire hole resulting from the failure of a prior shift of miners to explode all the charges placed in the hole assumed the risk of the explosion where it appeared that he was an experienced miner; that the shaft in which he had been and was working was a very wet one, and that in such shafts there are more misfire holes than in dry shafts, and that in this particular shaft there was a greater per cent of misfire holes than he had ever known in other shafts; that he did not know of any shifts but that had left misfire holes; that he did not know the kind of fuse used in the misfire holes; but he did not consider the fuses used of the best quality, and so informed the superintendent; that he was advised that the former shift reported that there were two misfire holes, but the particular location of the misfire holes could not be given; that he made all possible effort to find the misfire holes but failed and concluded there were no such holes. Being fully advised as to the risks, it is immaterial whether he knew the causes and also immaterial as to whether those risks were brought about by negligence on the part of the mine

operator. It can not be said that because the miner concluded that there was no misfire hole that he did not comprehend the risk.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

RISKS NOT ASSUMED.

DANGERS RESULTING FROM OPERATOR'S NEGLIGENCE.

A miner assumes no risk from dangers resulting from the mine operator's negligence.

Peterson v. Otho Development & Power Co. (South Dakota), 166 Northwestern 147, p. 148.

An employee never assumes the risk of danger due to the employer's negligence.

Staggs v. Gotham Mining & Milling Co. (Mo. App.), 199 Southwestern 717, p. 719.

NEGLIGENCE OF SHIFT BOSS.

A miner working in a mine and injured by a fall of rock does not assume the risk or dangers incident to his working place, where the shift boss had the authority to direct the miner to work in the particular place and informed him that he had inspected the rock and that the place was safe.

Federal Mining & Smelting Co. v. Anderson, 247 Federal 472, p. 473.

DANGERS OUTSIDE OF WORKING PLACE.

The operator of a drilling machine in a mine does not assume the risk or dangers and consequent injury in parts of the mine other than at his particular place of work.

Ulrich v. Utah Apex Mining Co. (Utah), 169 Pacific 263, p. 264.

SCOPE OF EMPLOYMENT.

MINER WAITING UNDER DIRECTIONS OF SUPERIOR.

A miner assisting a mine engineer in making measurement on and along the mine track was directed by the engineer to wait at a particular place on the track, until he made some measurements a short distance away. While so waiting, and through the carelessness of the mine foreman or boss, a loaded car against which the miner was standing or sitting was released, started down the incline, and injured the waiting miner. Under such circumstances the miner while waiting at the command of the mine engineer was engaged in the line of his employment at the time of the accident.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

"so use his own property as to not injure that of another person" is extended and requires one to use his property as not to injure the rights of another.

Hitchman Coal & Coke Co. v. Mitchell, 38 Supreme Ct. Rep. 65, p. 73.

SPECIFIC PERFORMANCE OF CONTRACT—OWNERSHIP OF PROPERTY.

The trustees for the Western Federation of Miners, a voluntary, unincorporated association of persons, and others as members of the association, brought an action against the Butte Miners' Union asking the court to decree that the miners' union had no interest in certain lands and property owned by the Western Federation of Miners, and asking a decree requiring the miners' union to perform all the terms of a certain charter from the Western Federation of Miners to the miners' union by conveying to the former certain property described, and seeking to restrain the miners' union from asserting claim to the property described. It was averred in the complainant's bill that the charter contained a clause and a provision to the effect that if the union should withdraw or be absolved, suspended, or forfeit the charter, all property, money, books, and papers should become the property of the Western Federation of Miners. The evidence showed that the original charter of 1893 was lost or destroyed, and that a new charter was issued in 1914. The evidence as to whether the new charter contained the forfeiture provision was conflicting and contradictory and insufficient to establish the forfeiture clause, and specific performance could not be decreed and a forfeiture of the property would not be ordered. Where the terms of a contract are not certain in themselves, so as to enable a court to arrive at the clear result of what all the terms are, the contract will not be specifically enforced.

Moyer v. Butte Miners' Union, 246 Federal 657, p. 659.

NUISANCE.

OPERATION OF OIL REFINERY.

Whether or not a use which is in itself lawful is a nuisance depends upon the locality and surroundings, the number of people in the vicinity, the prior use, whether it is continual or occasional, and the extent of the nuisance and injury caused to the neighbors from the use. If the injury is slight and trivial and occurs in the development of the natural resources of the land it is not deemed to be unreasonable. In the instant case the oil treated by the refinery company at the refinery was obtained elsewhere, and its operation had no connection with the products of the land or the development of its natural resources and under the evidence the quantity of oil,

refuse, fumes, and gases that were thrown upon complainant's land constituted an unreasonable use and a nuisance. However useful and lawful a business in itself is the company can not be permitted to carry it on in such a way as to cause material injury to the complainant and when the injurious substances were thrown upon his land in excessive quantities and in the manner shown, the use of the refinery became both unreasonable and unlawful.

Helms v. Eastern Kansas Oil Co. (Kansas), 169 Pacific 208, p. 209.

See Auxford Brown Ore Co. v. Hudson (Alabama), 77 Southern 243.

OIL REFINERY—ESCAPE OF OIL.

If the owner of a refinery permits oil, refuse, and poisonous substances in large quantities to escape from the refinery and flow over and upon adjoining lands causing material injury to the owner thereof, the use of the refinery will be deemed to be unreasonable and to constitute a nuisance.

Helms v. Eastern Kansas Oil Co. (Kansas), 169 Pacific 208, p. 209.

MINING LEASES.

LEASES GENERALLY—CONSTRUCTION.

CONSTRUCTION AND EFFECT—ESTATE GRANTED.

A mining lease for discovery of minerals vests a conditional estate in the lessee, but does not vest title to the minerals in place. It is an incorporeal right to mine, the exercise of which may exhaust the minerals. This right is beyond the control of the lessor, his heirs or assigns as long as the conditions upon which it depends are complied with, and therefore it binds the lands in the hands of the lessor and all persons holding under him. Whatever the right of the lessee may be when accurately defined, he is not the owner of the minerals in place, and the lease does not sever the minerals from the surface. But the lease vests an estate potential until the discovery of minerals, and actual afterwards, and that estate carries the right to exhaust the minerals.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 741.

CONSTRUCTION—CANCELLATION—RECOVERY ON THEORY OF PLEADING.

An action for the cancellation of a mining lease was based on an alleged forfeiture by reason of certain specific violations of the lease. Before a judgment of cancellation can be sustained it must appear that the lessor is entitled to the relief granted on the case as made and the pleadings presented, as he can not sue upon one theory and recover upon another.

Rembarger v. Losch (Ind. App.), 118 Northeastern 829, p. 833.

CONSTRUCTION—ABANDONMENT BY SUBLESSEE—DUTY OF SUBLESSOR TO PREVENT DAMAGES.

The lessee of a mine subleased the same to another for the purpose of operation, the lease providing that if the lessee should at any time fail or refuse to keep any stipulation on its part the sublessor might at his option terminate the lease and retake possession of the property after 10 days written notice thereof. The lease also provided that the lessee should have the right and privilege of terminating the lease at any time by giving the sublessor 30 days' notice in writing of such intention, the 30 days to be after the delivery to the lessor of the written notice. The mine was one that required the operation

of pumps constantly to prevent flooding. On a certain date the sublessee notified the sublessor of his intention to terminate the lease and also that he would suspend operating the pumps and authorized the sublessor to take possession of the property at any time and operate or protect the same. Shortly thereafter the sublessee abandoned the mine and neither he nor the sublessor did anything to protect it during the month following the abandonment. Thereupon the original lessor declared a forfeiture of the lease, and took possession of the property. Thereupon the original lessee, the sublessor, brought suit against the sublessee for damages for failure to comply with the terms of the sublease. The breach relied upon being the abandonment of the property during the 30 days covered by the notice, thereby giving a right to the owner to forfeit the lease and thereby losing the value of his lease. By its terms the sublessee could abandon the lease at any time on 30 days' notice and on receipt of such notice it was the duty of the sublessor, the original lessee, to protect himself from loss and to prevent forfeiture of his own lease. If he had gone into the possession of the mine and worked it during the period of 30 days he could have recovered as damages all the loss which he suffered by such operation, as such damages would have been the direct result of the sublessee's violation of the contract. But the complainant can not recover in an action against the sublessee damages that are not the direct result of the latter's violation of the sublease but are more properly referable to the complainant's violation of his own lease with the owner of the mine. Where a party is entitled to the benefit of a contract and can save himself from a loss arising from a breach of it at a trifling expense or with reasonable exertion, it is his duty to do so; and he can charge the delinquent with such damages only as with reasonable endeavors and expense he could not prevent. By the word "trifling" is meant a sum which is trifling in comparison with the consequential damages which the plaintiff is seeking to recover in the particular case. Under the circumstances the complainant was entitled to recover the nominal sum of \$1 only.

Bearcat Mining Co. v. Grasselli Chemical Co., 247 Federal 286, p. 287.

COAL LEASES.

CONSTRUCTION—INTENTION OF PARTIES.

The intention of the parties to a coal lease is its life, breathed into it in words, and these words must be applied as the parties applied them to the thing about which they were written. When two constructions may be equally admissible in a purely abstract sense the law then leans to concrete justice.

Unlou Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 233.

CONSTRUCTION—EFFECT AS A CONVEYANCE.

A coal lease in the nature of a conveyance of the right to mine, excavate, and remove coal underlying a tract of land is not a mere grant of an easement, but is a sale of the coal itself and is a conveyance of an interest in the land.

Simmons Coal Co. v. Board of Review, etc. (Illinois), 118 Northeastern 753, p. 754.

PRESUMPTION AS TO PURPOSE—CONSTRUCTION.

Parties will be presumed to have contracted with a view to the existence of the subject matter of the contract, which in a coal lease is the coal. The parties contracted with a view to its exhaustion, and so long as this remained unaccomplished and the lessee retained possession of the leased land, mining, appropriating, and removing the coal, it was bound to perform the conditions of the contract, under which it alone claimed the right to do so, by making the stipulated payments.—

Union Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 236.

CONSTRUCTION—TECHNICAL TERMS.

There is no rule of law which prohibits parties from making contracts concerning the mining of coal as fully and freely as for any other purpose and in the construction of such a contract a court is confined in its consideration to the terms of the contract alone. In construing such a contract the court will not consider the divergent technical significance in proper cases of the words "lessor," "lessee," "rents," royalties," "license," and others used indiscriminately in the instrument where its terms define such words so definitely that there can be no mistaking the sense in which they are used.

Union Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 235.

CONSTRUCTION—SUBJECT MATTER AND OBJECT—MINING ALL COAL.

A trustee holding a large amount of coal lands desired to have the coal mined out before the expiration of the trust. With this intention he executed a lease to a mining corporation owning an adjoining tract of coal land which recited that for and in consideration of the rents and royalties provided for and the covenants, agreements, and conditions set out, and to be kept, performed, and complied with by the lessee, the lessee had the right to take the coal from under the lands describing them containing in all 630 acres. This lease gave to the lessee the right to take the coal from under the land for a period of 12 years from April 1, 1901. The lease further provided

that the lessee should mine and carry away all the minable coal in the lands described that can be dug or mined under the rules of first-class mining prevailing in the southern Kansas coal district. The lessee on its part covenanted that it would mine and remove from the land all minable coal contained therein within the stated time and that it would mine and raise all minable coal without reference to size or quality existing underneath the surface of the land described. The lessee bound itself so to conduct its operations as to admit of the digging, raising or hoisting, and removing all minable coal in the lands and that it would have and maintain at its own expense sufficient equipment to promptly remove all coal mined. The terms of the lease leave no doubt as to its subject matter or object. The former was all the coal underlying the surface of the land described; and the latter was the mining and removing of all the coal, and when that was done and paid for the terms of the lease were fulfilled and the lessee could remove all equipment from the land. All the provisions of the lease lead to the mining and removal of all the coal under the land described.

Union Trust Co. v. Wear Coal Co. (Missouri), 190 Southwestern 230, p. 234.

INDUCEMENT TO EXECUTION—CONSTRUCTION.

A coal lease was induced from the fact that the lessor, as trustee, had a large tract of land underlaid with coal which he desired to dispose of in place during the administration of the trust, extending for some 14 years, without the trouble and danger of mining it. The lessee was a coal mining corporation owning a smaller tract of coal land adjoining the tract of the trustee. These two interests came together in a lease in which the intention is fully developed and which must control in the construction of the lease.

Union Trust Co. v. Wear Coal Co. (Missouri), 190 Southwestern 230, p. 233.

CONVEYANCE OF COAL WITH MINING RIGHTS—CONSTRUCTION.

A deed or lease granted to the lessee for the term of 10 years a certain described tract of land and a specified vein of coal known to exist therein with mining rights, together with the plant and all improvements and fixtures thereon, with covenants of good title and quiet and peaceable possession but without warranty of acreage or quantity of coal. In consideration of the grant the lessee covenanted and agreed to pay the lessor during the term 10 cents per ton for coal mined and guaranteed a minimum of at least \$31,000 to be paid in stated installments. During the term of the lease the grant constitutes a sale of coal in place upon the condition that it be removed during the term of the lease. The lease was operated and pay-

ments made as provided in the lease; but when the coal was all mined out it was found that on the basis of the royalty named overpayment had been made by the lessee to the lessor. The deed or lease contained no warranty or guaranty on the part of the lessor and none can be implied to the effect that the land leased contained 310,000 or 345,000 tons of coal as contemplated by the parties. In the absence of a warranty either express or implied and in the absence of mistake, fraud, or misrepresentation there is no liability on the part of the lessor for deficiency in quantity or quality of coal and the lessee can not recover for any payments made pursuant to the terms of the lease but in excess of the royalty on the coal actually mined.

National Coal Co. v. Overholt (West Virginia), 94 Southeastern 735, p. 737.

ACTION FOR ROYALTIES—EVIDENCE—STATEMENT OF ACCOUNT.

In an action by the lessor of coal lands and a coal mine on a bond given by the lessee to secure the payment of royalties on coal mined within a given term an amended statement of claim was properly admitted in evidence upon the ground that the statement was not specifically or sufficiently denied in the affidavit of defense.

Pittsburgh Block Co. v. Olive Coal Co. (Pennsylvania), 103 Atlantic 52.

ROYALTIES—LIEN ON FIXTURES.

A coal lease provided that all rents and royalties agreed to be paid on the coal mined should be a lien on the leasehold, fixtures, and improvements thereon and on the personal property of the lessee, and on the coal mined and the coke made on the premises. There was subsequently attached on the leased premises in a sheet iron building and on a concrete foundation constructed therefor an engine and a generator. The bolts holding these machines were embedded in the concrete and ran through holes prepared in the machinery and held by nuts; the machinery could be removed at a small expense. As between lessor and lessee these machines were trade fixtures and removable by the latter under the liberal rule of the lessee's right of removal where it would not cause any material injury to the estate, and the machines could be detached without losing their essential character or value as personal chattels.

Hart v. Appalachian Washed Coal Co. (Tennessee), 201 Southwestern 515, p. 516.

LIABILITY OF ASSIGNEE FOR ROYALTY.

A coal mining company that was not a party to a lease, admitted a transfer of the lease to it and that it undertook to operate the mine

under the lease, can not be permitted to accept only so much thereof as it desires and reject such portions thereof favorable to the lessor and made for his protection. The coal mining company as assignee of the lease became liable for the royalties or rents that were fixed by the lease.

Bruce Coal Co. v. Bibby (Alabama), 77 Southern 545, p. 547.

MINIMUM ROYALTIES GUARANTEED—LIABILITY.

A coal lease provided for the payment of 7 cents per ton royalty for all coal mined. The lessee by the lease obligated himself to pay royalty for not less than 50 tons per day after four months from the date of the lease whether that amount of coal was mined or not, and at the end of each month if an amount equal to the royalty on 50 tons per day at 7 cents per ton has not been paid the lessee should make good the shortage. The lease contemplated active mining operations after the expiration of four months and the lessee guaranteed a daily output of a minimum amount of 50 tons per working day during the life of the lease unless sooner terminated by exhausting the merchantable and minerable coal. The lessor was guaranteed that he should receive an income monthly equal to the royalty of 7 cents upon 50 tons per day, whether that amount was mined during the month or not and the payments were to continue either until the term of the lease expired or the coal was sooner exhausted.

Bruce Coal Co. v. Bibby (Alabama), 77 Southern 545, p. 546.

MINIMUM ROYALTY—ANNUAL PAYMENTS.

A coal-mining corporation leased a tract of coal lands and agreed to mine out all the coal within a period of 12 years beginning April 1, 1901. The lease provided that the lessee should pay for the year ending March 31, 1902, "the aggregate sum of at least \$3,000, whether said lessee mines during said year ending March 31, 1902, 50,000 tons of coal, mine run, or not"; and "that thereafter, that is to say, for the 10 years beginning with April 1, 1902, and ending with the 31st day of March, 1912, said lessee shall and will pay the lessor the aggregate yearly sum of \$7,500, whether said lessee mines in each year during said 10 years ending March 31, 1912, 125,000 tons, mine run, of coal or not"; and "that if at the end of any one or more of said 10 years it shall be found that said lessee has mined in that year more than 125,000 tons of coal, mine run, it shall at once pay to the lessor the royalty at 6 cents per each ton, mine run, on such excess." These provisions clearly indicate that each year's operations should, with respect to compensation, stand on its own feet. The parties chose while fixing a minimum limit to the amount of coal

to be mined yearly to fix the amount to be paid yearly in compensation for failure to reach that limit. The coal mining company elected to carry on the mining operations in one of two optional methods and to pay prices nominated in the lease. The company retained possession of the land up to the date of the trial of the case, mining coal continuously. This it could only do by compliance with the terms of the lease under which it claimed the right to carry on the mining operations.

Union Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 235.

SUBLESSOR'S RIGHT TO MINIMUM ROYALTY.

The lessee of a coal mine agreed to pay a royalty of 5 cents per ton on all coal mined. The lessee sublet the mine and by the terms of the sublease the sublessee agreed to pay a royalty of 7 cents per ton and bound himself to pay such royalty for 50 tons per day, after a certain stated time, whether that amount of coal was mined or not, and if an amount equal to the royalty of 50 tons per day at 7 cents per ton was not paid then the sublessee was to pay the shortage, payments to continue for the term of the lease or until the merchantable or minable coal was exhausted. The sublessor had the right to contract against any delay in mining which would deprive him of the benefit of his profit of 2 cents royalty on every ton. The sublessee was amply protected against the possibility of paying royalty on more coal than there was in the mine by complying with the lease in mining the requisite number of tons until the coal was exhausted. The payments of royalty would by the terms of the lease cease and terminate on the exhaustion of the merchantable and minable coal and this afforded the sublessee ample protection.

Bruce Coal Co. v. Bibby (Alabama), 77 Southern 545, p. 546.

ACTION ON BOND TO SECURE ROYALTIES—CONCLUSIVENESS OF RECEIPT— QUESTION OF FACT.

The Oliver Coal Company and the Maryland Casualty Company, as principal and surety, executed a bond to the Pittsburgh Block Coal Company to secure the performance of a lease of certain coal property and the payment of royalties upon coal mined therefrom. In an action on the bond the lessor claimed a large balance due for unpaid royalty on coal mined under the lease by the Oliver Coal Company. Liability was denied upon the ground that all royalties had been paid and depended for proof thereof on a receipt given by the lessor company. The receipt was not given to the mining company but was given to a trustee of the insurance company and by way of accounting for the distribution of that much of the sum. The receipt did not

purport to be in full for all royalties for coal mined at the time. Under the circumstances as shown the question of the conclusiveness of the receipt was one of fact for the jury.

Pittsburgh Block Coal Co. v. Oliver Coal Co. (Pennsylvania), 103 Atlantic 52.

LIEN ON FIXTURES—RIGHTS AS BETWEEN LESSOR AND SELLER.

A coal mining lease gave the lessor a lien on the leasehold and the fixtures, improvements, and personal property of the lessee to secure the payment of royalties. The lease provided that the lessee should surrender the premises with the improvements, fixtures, and machinery in good working order and gave the lessee the right to remove the property placed upon the premises by the lessee. After the execution of the lease the lessee purchased an engine and a generator and placed them on the leased premises on concrete beds fastened with bolts. The seller of the engine and the generator retained the title thereto to secure the payment of the purchase price therefor. The lessor as to the engine and generator stands only in the position of a prior mortgagee or lienor asserting a lien on subsequently acquired property of the mortgagor or lienor and could claim only such rights as his lessee acquired in the subsequently placed property, which is only an equity, assuming that the engine and generator can be removed without damaging the premises. As between the lessor and the seller of this machinery the seller's right to take possession of and remove the machinery either on failure to pay or on the termination of the lease was superior to that of the lessor.

Hart v. Appalachian Washed Coal Co. (Tennessee), 201 Southwestern 515, p. 517.

USE OF SHAFT PERMITTED—NO RECOVERY FOR USE.

The owner of a large tract of coal lands leased the same for mining purposes to a mining corporation owning and mining a small tract adjacent to that of the lessor. The mining corporation agreed to construct and provide a shaft, equipment, and switches at its own expense, but the lease provided that if all the coal in the lessor's land should be mined and removed, as required by the lease, and the provisions of the lease fully complied with, before all the coal was mined out of the mining company's own tract, then the lessee should have the right to continue to use the shaft in mining and removing the coal from its own tract for a certain stated time. The conventional relation created by the lease should end with the removal of the coal from the lessor's land subject only to the permission to the lessee to retain the possession of the shaft and equipment for the removal of its own coal. The fact that the shaft had been constructed and the plant installed at the expense of the lessee indicates the justness and

propriety of the provision, and no compensation to which the lessor may be entitled can be predicated upon the continued possession of the shaft by the lessee after the exhaustion of the coal in the lessor's lands.

Union Trust Co. v. Wear Coal Co. (Missouri), 199 Southwestern 230, p. 234.

OIL AND GAS LEASES.

CONSTRUCTION AND VALIDITY.

An oil and gas lease executed by a widow on lands that her husband owned in his lifetime is not invalid because her title depended on an instrument testamentary in character, duly acknowledged and recorded, and by the terms of which instrument the wife was to have the rent, and to use or occupy the same as long as she saw fit, and the instrument taken as a whole must be regarded as a will rather than a deed.

Colburn v. Simpson (Kansas), 170 Pacific 383.

CONSTRUCTION AND NATURE.

A landowner granted the oil and gas in certain described lands and gave the right to enter thereon to mine and market the same. The lease provided that in case no well was drilled within three months it should become null and void, unless the lessee thereafter paid quarterly in advance a specified sum as compensation in lieu of drilling within the succeeding quarter and for the use of gas produced and marketed from any well drilled. The lease reserved to the lessor one-eighth of the oil as royalty. Such an instrument does not constitute a grant of the oil and gas in place, but creates a modified form of lease or license to produce and market the minerals for the joint benefit of the lessor and lessee agreeably with the terms, covenants, and conditions of the contract.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

CONSTRUCTION—LESSEE'S OPTION TO SURRENDER—RIGHT OF LESSOR.

An oil and gas lease, for the nominal sum of \$1, granted to the lessee the oil and gas under the described premises with the right to enter thereon for the purpose of drilling and operating for oil or gas and to erect, maintain, and remove all buildings, structures, pipes, pipe lines, and machinery necessary for use in the operations. The lease expressly provided that the lessee might at any time remove all his property and reconvey the premises and thereby the agreement should be null and void. Under the provisions of the lease there was no obligation upon the lessee either to drill or pay rent, but the doing

of either was entirely optional with the lessee, and as the lease conferred on the lessee the right to surrender the premises and remove all his property at any time without further obligation on his part, a corresponding right exists on the part of the lessor to compel a surrender.

Melton v. Cherokee Oil & Gas Co. (Oklahoma), 170 Pacific 691, p. 693.

CONSTRUCTION—ORAL AGREEMENT AS TO PAYMENTS—STATUTE OF
FRAUDS.

An oil and gas lease was negotiated by several lessees and was made to one of them for the benefit of all. By an agreement among all the one to whom the lease was made advanced the purchase price, and the others on demand paid their respective shares. The claims and interests of the other beneficiaries in the lease can not be defeated on the ground that the transaction amounted to an oral contract for the sale of an interest concerning lands under the statute of frauds. It is not a case where one lessee purchased the lease and agreed to sell his interest to the others; but the original transaction was participated in by all, and the title was taken by one for the benefit of all, and in such case the statute of frauds has no application.

Aaron v. Rothrock (Kansas), 169 Pacific 1161.

VALIDITY—PERPETUITIES.

A lease granting the oil and gas in land with the right to enter thereon to mine and market the same with a provision that in case no well is drilled within three months the lease shall become null and void unless the lessee thereafter pays quarterly in advance a specified sum as compensation in lieu of drilling within the succeeding quarter and for the use of gas produced and marketed from any well drilled, is not void as creating a perpetuity.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

RIGHT OF LESSEE TO POSSESSION.

An oil and gas lease giving the lessee the right for 10 years to explore for oil entitles the lessee to the possession of the leased premises for the purpose of exploration.

Beatty Oil & Gas Co. v. Blanton, 245 Federal 979, p. 981.

RIGHT OF LESSEE TO SPECIFIC PERFORMANCE.

By the terms of an oil and gas lease it was entirely optional with the lessee to drill and develop the premises or to pay a certain stated amount. The lease also provided that the lessee could at any time re-

move all of his property and reconvey the leased premises and thereupon the lease should be null and void. Subsequently and on the failure of the lessee either to drill or to pay the lessor, the owner leased the lands to other persons for oil development and the original lessee brought suit against the lessor and the second lessees to cancel the subsequent lease and to enjoin the defendants from drilling for oil upon the premises. The relief sought by the complainant was in the nature of a decree for specific performance of a lease containing a surrender clause giving the lessee, the complainant, the option to terminate it at any time. Such a lease is not certain, fair, and just in all its parts. The complainant had not himself performed the contract on his part and had not placed himself in a position where he could be compelled to perform. A surrender clause in an oil and gas lease giving to the lessee an option to terminate the lease at any time deprives the lessee of the right to specific performance, unless and until he has performed the contract or placed himself in such a position that he might be compelled to perform the same on his part.

Melton v. Cherokee Oil & Gas Co. (Oklahoma), 170 Pacific 691, p. 694.

INTEREST OF LESSEE—NATURE OF OIL AND GAS—APPORTIONMENT OF ROYALTIES.

Under an oil and gas contract giving the privilege of drilling and developing the land for oil, until severance takes place, the lessee has no title and on severance and not earlier when the royalty in oil is payable. At that time the oil or gas is personal property after alienation or disposition of which no deed or other solemn instrument of conveyance is necessary but it is personal property in the hands of the lessee and he has bound himself to deliver a portion of it called royalty to the lessor as rent in kind for occupation, use, and operation of the lessor's mines. The royalty is a rent susceptible of division as if it were a rent payable in money. While the lease does not actually pass title to the oil or gas, it confers a right to take it, and where there is a severance of or a partition of the leased lands, the divided tracts go into the hands of their owners subject to such right, whether they are acquired by deed, will, or a decree of partition.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 743.

DEATH OF ANCESTOR—RIGHT OF HEIRS ON PARTITION—EFFECT OF PARTITION ON LESSEE'S RIGHTS.

On the death of a lessor of an oil and gas lease the leased lands descended to his heirs burdened by the right of the lessee and he is complete master of the situation as to the oil and gas, having the right to drill where he chooses on the leased premises, and a partition

of the lands among the heirs in no way affects the lessee's right or liberty in that respect. A lease on a single tract of land subsequently broken into several subdivisions by partition is not segregated and converted into as many distinct leases as there are subdivisions. That could be done only with the consent and cooperation of the lessee, but as to him the lease and its subject, the tract of land, are entireties, and after as well as before partition there is one lease of one tract yielding, when productive, one royalty or rental in the aggregate. The rent or royalty is an entire thing arising out of the whole tract of land, and although the royalty oil or gas rental comes from certain wells does not legalize the rent or return of the wells or of the severed tract of land on which they are located, but it is the return of the whole tract covered by the lease. In legal contemplation the wells are not drilled on the several portions as under the lease on that portion, but they are drilled under the lease as made, which binds and holds all the parties after division as it did before.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 741.

PARTITION OF LEASED LANDS—RIGHTS OF SEPARATE ALLOTTEES.

Where on the death of the lessor of oil and gas lands the leased lands have been partitioned among the heirs of the lessor, it would be flagrantly inequitable to permit the lessee and the owner of one parcel of the divided land to irrevocably tie up all the other parcels and drain the oil and gas out of them. The subdivisions may be small and often are, so one or two wells on one part would completely drain the others and their owners are powerless to prevent it by drilling or in any other way and are precluded from any share in the royalty. Though their lands are burdened with a lease by virtue of which their minerals are taken away, they are denied all benefit. This theory makes the lease a burden on all the subdivisions for the benefit of the one on whose part the wells are drilled. Operations of wells on his part may constitute the vital and controlling condition of the lease and make it bind other subdivisions without the drilling of any wells thereon or the payment of either rent or royalty to the owners thereof. They can neither drill on their lands, force the lessee to do so, or cause it to be done by anyone else, but are bound hand and foot for the benefit of the lessee and the owner of the subdivision on which he sees fit to put his wells. Such an unjust rule should not be adopted but the rule of apportionment of rents or royalties treats the leased land as an entire thing and divides the rent or royalty among the assignee or reversionman, as the land is divided, according to the relative value of the parts, and not with reference to which each part produces. If the lease did not bind all the land and the drilling on one tract released the balance then

there would be no action for an apportionment of the rent or royalty, but since it binds all there must be an apportionment of the benefits to prevent the existence of a grievous burden without any reciprocal benefit.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 742.

LEASEHOLD REVERSION—ROYALTIES—RIGHT OF WIDOW.

Where the lands of which the husband died seized was subject to a valid oil and gas lease at the time of his death, yielding a rental, the widow is dowable of the reversion and the rent or royalty as an incident of the reversion.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 744.

DEATH OF LESSOR—DOWER RIGHTS.

The owner of land leased the same for oil and gas purposes and died before any wells were drilled. Partition was had of the leased land and dower lands assigned to the widow and to other heirs, respectively, and subsequently drilling operations were commenced and numerous producing wells drilled. In such case the wells drilled by the lessee on the portion of the land assigned to the widow as and for her dower are not mines or wells worked by her, since the working right is held by the lessee even though they may be deemed mines opened in her husband's lifetime, and she is not entitled to the entire royalties and rents accruing from such wells nor is her dower right limited to such royalty and rents as subjects thereof. She is entitled to dower whatever its extent may be when the royalties and rents accrue from all the wells drilled on the entire tract of land covered by the lease.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 741.

PARTITION OF LEASED LANDS—RIGHT TO ROYALTIES.

A partition was made among cotenants of a tract of land on which there was a subsisting oil and gas lease executed by the ancestor in his lifetime, and there was an assignment of dower therein to the widow before any wells had been drilled on the leased premises. The decree for partition did not mention either the lease or the royalties or rents provided by it, and the pleadings on which the decree was founded were silent as to the lease and rights created by it. The decree under such circumstances does not extend to or include the royalties and rentals and the owner of each lot assigned therein is entitled to a proportionate share of all the royalties and rentals accruing from the wells drilled on the entire tract of leased land, subject to the widow's right of dower therein.

Campbell v. Lynch (West Virginia), 94 Southeastern 739, p. 741.

PAYMENT OF ROYALTIES BY CHECK OR DEPOSIT.

An oil and gas lease granted to the lessee the right for 10 years to explore for oil, with a covenant on the lessee's part to complete a well within 1 year or pay to the lessor at the rate of 10 cents per acre for each additional year that the completion was delayed, payments to be made quarterly in advance. The lease provided that the payment of rental should be by check, payable to the order of the lessor mailed to or deposited in a certain stated bank to the order of the lessor. By such arrangement the bank was constituted the lessor's agent to receive payment of the rental, and it was sufficient to make payment to the bank by check as well as to the lessor directly.

Beatty Oil & Gas Co. v. Blanton, 245 Federal 979, p. 980.

PAYMENT OF ROYALTY TO AGENT—FORFEITURE AVOIDED.

Under an oil and gas lease providing for payments of royalties quarterly in advance, by check or by deposit in a certain stated bank, the bank becomes the agent of the lessor to receive the payments of the royalties, and the receipt and acceptance of a check as payment by the bank, though made after due, is sufficient to prevent a forfeiture of the lease where the lessor, after receiving notice of the payment, did not repudiate it but acquiesced in it.

Beatty Oil & Gas Co. v. Blanton, 245 Federal 979, p. 981.

LEASE OF INDIAN LANDS—RECORD AS NOTICE.

The act of Congress of March 1, 1907 (34 Stats., 1026), provides that the filing of any lease in the office of the United States Indian Agent, Union Agency, Muskogee, Indian Territory, shall be deemed constructive notice. The constitution of Oklahoma provides that all laws in force in the Territory at the time of the admission of the State into the Union not repugnant to the Constitution shall remain in force in the State until altered or repealed. This provision in the enabling act preserved the authority of the Government of the United States over the Indians, their lands, property, and other rights, and the Government still retains such right. An intention to repeal the existing Federal laws and regulations can not be gathered from the Oklahoma enabling act, reserving to the General Government the authority to make laws and regulations in the future respecting Indians. An oil and gas lease filed in accordance with the act of Congress of March 1, 1907 (34 Stats., 1026), is effectual to impart notice to all persons subsequently dealing with the lands therein described.

Scioto Oil Co. v. O'Hern (Oklahoma), 169 Pacific 483, p. 484.

TRUST CREATED BY PAROL—RIGHTS OF BENEFICIARIES.

An oil and gas lease was executed to one of several purchasers all of whom joined in paying the consideration, under an agreement that the one to whom the lease was made was to hold it for the benefit of all. Under such circumstances neither the trustee nor the purchaser from him with notice of his fiduciary relation can defeat the trust on the ground that it was not created or evidenced by writing even though it is assumed that a trust in relation to such a lease is one concerning real estate.

Aaron v. Rothrock (Kansas), 169 Pacific 1161.

TRUST—CREATION BY PAROL—VALIDITY.

The statute of Kansas provides that where a conveyance is made to one person and the consideration paid by another no trust shall ordinarily result in favor of the latter. The statute also provides that where it shall be made to appear that by agreement and without any fraudulent intent the party to whom the conveyance was made or in whom title shall vest was to hold the land or some interest therein in trust for the party paying the purchase money or some part thereof, the provision against a resulting trust shall not apply. This latter principle applies to an oil and gas lease purchased by several but executed to one under a parol agreement that he was to hold the same as trustee for all, the payment for the lease being made by all the parties.

Aaron v. Rothrock (Kansas), 169 Pacific 1161, p. 1162.

RATIFICATION OF SALE OR LEASE BY TRUSTEE—RIGHTS OF BENEFICIARIES—ESTOPPEL.

A trustee who held an oil and gas lease for beneficiaries who contributed their part in the purchase of the lease, sold and assigned the same to a third person without the consent of the beneficiaries. A beneficiary who elected to hold the trustee personally responsible for his interest in the lease thereby ratified the sale and is estopped from recovering from the purchaser and assignee of the lease any interest therein.

Aaron v. Rothrock (Kansas), 169 Pacific 1161, p. 1162.

DUTY OF LESSEE TO DEVELOP AND OPERATE WELLS—CONSIDERATION.

The fact that a condition subsequent in an oil and gas lease or conveyance has been complied with by the production of oil within the time specified, does not end all obligations on the part of the grantee or lessee, where the only consideration moving to the grantor.

other than a one-eighth interest in the oil which might be produced and saved, was \$5. The parties to the grant did not regard the money named as the real consideration, but indulged the hope and expectation that oil in paying quantities would be found beneath the surface of the land, and when so found, the one-eighth portion delivered in the pipe line was to constitute the real consideration for the grant. This being the intention of the parties, it was the duty of the grantee or lessee to operate the wells continuously in the manner contemplated by the undertaking. The provision of the lease making it the duty of the grantee to deliver to the grantor in a pipe line his share of the oil, and to pay therefor suggests the intention of the parties, and it can not be claimed that the provision contemplated the operation of the wells at the will of the grantee any more than that the right to operate by the grantee could be divested at the will of the grantor.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 689.

IMPLIED COVENANT TO DEVELOP.

Under an oil and gas lease that is silent as to the number of wells to be drilled, there is an implied covenant that the lessee shall reasonably develop the lands and reasonably protect the lines.

Alford v. Dennis (Kansas), 170 Pacific, 1005, p. 1007.

If it can not be said that the duty to develop continuously and produce the land's mineral resources in a reasonably diligent manner, after discovery thereof in paying quantities, is not expressly provided for by the terms of a lease or grant, then such duty unquestionably arises by implication. Such implication arises upon the provision in a lease reserving to the grantee the right of ingress and egress over the surface land; the right to lay pipes for both production and transportation of all minerals when discovered and produced, and the duty imposed upon the grantee to deliver to the grantor in a pipe line his share of oil and to pay for the same quarterly.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 689.

IMPLIED COVENANT TO DEVELOP—BREACH AND REMEDY.

An oil and gas lease, covering two tracts of land, was for a term of 10 years and as long as oil or gas might be found in paying quantities. The lease required the lessee to pay royalties on all paying wells and to commence operations within six months and to complete three wells before a stated date, with a provision "that no other or additional expense shall be incurred under this lease." The larger

tract was developed and many wells drilled thereon, but in nearly 14 years nothing was done toward drilling or developing the smaller tract. The assignee of the lessor, a grantee of the undeveloped tract, brought suit to cancel the lease on the ground of a breach of an implied covenant to prospect and develop the leased lands, but without previous demand on the lessee to drill on this tract. The rule that equity will not relieve against an improvident bargain prevents an absolute forfeiture, and equity will not forfeit a contract for the mere breach of one of its implied covenants, but the court under such circumstances must give the landowner some redress either in damages, if these be ascertainable, or in the alternative that the lessee be required to drill and develop the land in a reasonable time pursuant to the implied covenant under penalty of forfeiture.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1007.

IMPLIED COVENANT TO DEVELOP—NO FORFEITURE.

Equity will rarely arbitrarily declare the forfeiture of an oil and gas lease for a breach of an implied covenant. It will never so do where less drastic redress will satisfy the demands of justice.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1006.

IMPLIED COVENANT TO DEVELOP SEPARATE TRACTS.

An oil and gas lease covering two separate tracts of land obligated the lessee to drill three wells prior to a stated subsequent date and contained a provision to the effect that "no other or additional expense should be incurred." This clause is susceptible of restriction to the acknowledged obligation to drill the three wells prior to the stated date. It can not be said that the clause exempted the lessee from developing one of the separate tracts to any extent or at any time. If the separate undeveloped tract was not to be developed sometime there was no reason to include it in the lease, and standing as it does it is of no value to the lessee. Unless the lessee had a bona fide intention to prospect and develop this separate tract he had no proper purpose in leasing it and a cancellation of the lease would do him no injury. Equity abhors forfeitures, but it likewise abhors injustice. The lessor's lands are burdened with an oil and gas lease and he is entitled to have his land prospected for oil and gas within a reasonable time.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1007.

DUTY TO DEVELOP—INTENTION OF PARTIES.

An oil and gas lease for certain described lands provided that if oil is found in paying quantities in the first well the lessee should

within 30 days from its completion begin the boring of a second well on some other acre of the leased tract "and continue to bore additional tracts therein leased as developments may justify until at least five or six wells have been completed or the acre upon which said second party has failed to drill reverts to the first party by written notice to that effect." The leased tract was laid off or was treated by the parties as being laid off in acre blocks and it would appear that the drilling was intended to be by the acre. The lease is ambiguous as to whether it requires a well to be drilled on each acre and not merely two on different acres and three more any place upon the leased premises. Under such ambiguity the question should be submitted to a jury as to the intention of the parties in this respect.

Kirlicks v. Texas Co. (Texas Civ. App.), 201 Southwestern 687, p. 690.

IMPLIED COVENANT TO DEVELOP—SUIT AS A DEMAND.

A landowner who leased his land for the production of oil and gas, but without any provision for a minimum amount of development work, can not forfeit the lease even for complete failure to develop for a long period of time, for such a breach of the implied covenant to develop. But on failure of the lessee to develop the landowner may demand that development work be commenced within a reasonable time and prosecuted with reasonable diligence or the lease will be forfeited. The commencement of a suit to forfeit the lease for failure to develop is a sufficient demand and on a proper showing the court may render an alternative decree to the effect that development work shall be begun within a reasonable time and prosecuted with reasonable diligence or that the lease shall be forfeited.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1007.

FAILURE TO REQUIRE DEVELOPMENT.

It is improvident for a landowner to grant an oil and gas lease on a tract of land for a long term without providing that a certain minimum of work should be done on the leased lands. But it is not in his province to end a contract merely because it is a bad bargain. It is not the intention under such a lease that the land should be held indefinitely without development, and a landowner may have some redress in damages for breach of the implied covenant where "it was the intention of the parties to the lease" that the leased premises should be drilled and explored for oil and gas and not held indefinitely without exploration.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1006.

DUTY OF LESSEE TO DEVELOP—CANCELLATION ON FAILURE.

A lessee in an oil and gas lease can not indefinitely hold a lease without operations to render the land valuable by the production of the minerals which the lease authorizes him to mine and market for the joint use and benefit of the lessor and lessee, according to its terms and covenants; but if he negligently fails or refuses, when notified to proceed with developments to inaugurate within a reasonable time thereafter and diligently prosecute such drilling operations as may reasonably be deemed necessary or sufficient to test the land for these minerals, equity will grant relief by cancellation upon application therefor by the lessor.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

SEPARATE LEASED TRACTS—FAILURE TO DEVELOP ONE—REMEDY.

Where two separate tracts of land are leased under one oil and gas lease and the lessee has prospected and developed one of the tracts only, equity will not cancel the lease on the undeveloped tract, but it will not permit the lessee, without consideration, to hold the lease indefinitely for speculative purposes to the prejudice of the interests of the lessor.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1006.

COVENANT TO DRILL—LESSOR'S OPTION—CANCELLATION.

Where the lessor desires to enforce the covenant to drill in an oil and gas lease he must first demand performance of or compliance with the covenant, and if within a reasonable time after such demand the lessee fails and refuses to develop the land as contemplated by the lease, equity will at the suit of the lessor grant relief by cancellation.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

FAILURE TO OPERATE—LIABILITY FOR DAMAGES.

In an action by an assignee of an oil lease against the lessee for damages for failure to produce oil as required by the lease, the recovery of damages by the assignee as for the oil that should have been produced must be limited to the period from the date of the acquisition of an interest in the lease by the assignee, to the time when the leased lands were taken possession of by the bankruptcy court because of the insolvency of another assignee of an interest in the lease, where the lessee made an effort to obtain possession of the land for

operations and attempted to obtain an order to operate the same under the direction of the bankruptcy court.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 691.

PAYMENTS IN LIEU OF DRILLING—RIGHT OF LESSOR TO HAVE LANDS DEVELOPED.

An oil and gas lease provided that on certain conditions it should become null and void unless the lessee pays quarterly in advance a specified sum as compensation in lieu of drilling within the succeeding quarter. Such a lease or agreement does not create a mere tenancy at will terminable at the option of the lessor or void as a perpetuity; but the lessor may require development after the end of any quarter for which the lessee has paid the agreed consideration for delay upon reasonable notice to the lessee; and in the event of the lessee's failure to drill within reasonable time after such notice, equity will cancel the lease upon application by the lessor.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

ACCEPTANCE OF RENTALS—WAIVER OF COVENANT TO DRILL.

Payment of the stipulated sums quarterly in advance by a lessee as provided in an oil and gas lease and acceptance thereof by the lessor, without protest or complaint, and without a demand to drill within a reasonable time after the termination of a quarter for which payments were made and accepted, operates as a waiver of the covenant to drill within such quarter.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

ABANDONMENT BY LESSEE—AVAILABLE TO ASSIGNEE OF LESSOR.

Abandonment as applied to an oil lease is the relinquishment of a right for the period of years stated to remove minerals or oil from beneath the land described. If such a right is in fact relinquished during the ownership of the lessor, it is none the less so when the lessor conveys the land to another, as the right so lost can not by mere transfer of the property be revived.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 689.

ABANDONMENT BY LESSEE—RIGHTS OF CREDITORS AND OF LESSORS.

An oil and gas lease provided that upon failure of the lessee to drill or make the payments provided for, the lessor should have the right to declare a forfeiture. The lessee began operations, but be-

fore the well was complete became insolvent, permitted the lease to lapse, left the rig, tools, and appliances on the premises and abandoned the enterprise. The lessor, although he had not declared a forfeiture of the lease, is to be regarded as in possession and control of the property and he is a proper garnishee of the actions brought by the persons who performed the labor for the lessee.

Hamilton-Collinson Hdw. Co. v. Arkansas City Oil & Gas Co. (Kansas), 169 Pacific 190.

ABANDONMENT AND FORFEITURE—INTENTION.

When it is claimed that a right under an oil lease has been lost by abandonment and upon which forfeiture of the lease is sought the issue of intention is rarely if every absent. An intention to abandon is to be found by a jury from a consideration of the nature and extent of the undertaking, the conduct of the parties, and what they did do or failed to do in that respect. The rule does not mean that the jury shall find that a specific mental reservation was reached by the person so charged to so abandon the right, as such a finding could never have a basis in the testimony except by admission or confession.

Munsey v Marnet Oil & Gas Co. (Tex. Civ. App.), 199 Southwestern 686, p. 690.

FORFEITURE—RIGHT TO DECLARE.

A provision for forfeiture in an oil and gas lease is for the benefit of the lessor and is more strictly enforced than the ordinary lease between landlord and tenant; but it is not a rule of universal application that all defaults made by the lessee entitle the lessor to declare a forfeiture or have a decree canceling the lease. If a forfeiture is for nonpayment of money or the performance of some other act, equity regards such payment or performance as the real or principal intent, and the forfeiture merely as an accessory where time is not made of the essence of the contract and will not enforce such forfeiture where the actual damage sustained by the lessor can be adequately compensated.

Rembarger v. Losch (Ind. App.), 118 Northeastern 829, p. 833.

FORFEITURE—PLEADING—QUESTION OF FACT.

The lessee in an oil lease, in an action for the price of oil sold, included other lessees and persons interested, and claimed his right to recover by virtue of the terms of the lease, admitting that other parties were entitled to the royalty part of the oil and that the purchaser of the oil should be compelled to pay to the parties entitled to receive the same. Under such circumstances the lessee, under the

familiar principle can not question the title of the parties standing in the position of the lessor and can not as against them demand a forfeiture of the lease.

Kirlicks v. Texas Co. (Texas Civ. App.), 201 Southwestern 687, p. 690.

FORFEITURE ON GROUND OF ABANDONMENT.

In an action by an assignee of the lessor of an oil and gas lease to forfeit the lease on the ground of abandonment, all the facts and circumstances and the acts of the parties and their agents properly pleaded should be admitted in evidence and presented to the jury without limitation, for the reason that when the assignee acquired the land and interest of the lessor in the oil lease any rights inuring to the original lessor in like manner inured to the assignee. The lease expressly declared that its conditions should extend to the heirs, executors, administrators, and assigns of the lessor. If the lessee prior to the assignee's purchase of the land had in fact so acted as to satisfy the jury on the issue of abandonment such abandonment inures to the benefit of and could be asserted by the assignee of the lessor, or if the conduct of the lessee partly during the ownership of the lessor and partly during the ownership of the assignee of the lease was sufficient to satisfy the jury on such issue the assignee could rely thereon, as otherwise it might result that a complete abandonment had taken place and the right of forfeiture acquired, but because of the change of ownership the lessee could claim a right wholly lost.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 688.

FAILURE TO DEVELOP—FORFEITURE.

The failure to market the product of one gas well and to proceed with reasonable diligence to prospect for and develop others is insufficient to summarily forfeit the lease, but may be the basis of an action for damages and have a court of law to determine whether there was an adequate remedy at law for failure to develop. In such a case a court may enter an alternative decree, upon proper proof, to the effect that the lessee should proceed within a reasonable time to develop the property, or failing therein that the lease should be canceled.

Alford v. Dennis (Kansas), 170 Pacific 1005, p. 1006.

An oil and gas lease containing a stipulation on the part of the lessee to commence operations on the premises within one year from a stated date or pay for the delay, gives the lessee an option to drill or pay, and on the lessee's failure to do either the lessor may, at his option, forfeit the lease.

Melton v. Cherokee Oil & Gas Co. (Oklahoma), 170 Pacific 691, p. 693.

FAILURE TO OPERATE WELLS—ABANDONMENT AND FORFEITURE.

A failure to operate wells for a given period under an oil lease might or might not furnish a basis for a finding that an intention to abandon was established by such failure depending upon what brought about the cessation of operations, or cessation for a period might afford no basis whatever to support such a finding. Whether the cessation of operations was temporary, was excusable, or evidenced an intention to abandon the right secured by the lease was for the jury to determine under appropriate instructions by the court in an action to forfeit an oil lease on the ground of abandonment.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686. p. 690.

FORFEITURE—ERRONEOUS INSTRUCTION AS TO RIGHT OF FORFEITURE.

It is error for a court to instruct a jury in an action to cancel or forfeit an oil and gas lease to the effect that the law looks with disfavor upon and discourages the forfeiture of rights of parties, and declares that before a forfeiture will be decreed the evidence on which the forfeiture is predicated must preponderate in favor of the forfeiture. The general rule of law as stated by the court in an instruction does not apply where the grant is in the hope and expectation of pecuniary profit from mineral development. In such cases the rule that equity abhors forfeitures does not apply for the reason that forfeitures when the lessee is guilty of laches is in that respect but equity.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686. p. 688.

FORFEITURE OF LEASE—ORDINARY CARE.

In an action to forfeit an oil lease for the failure of the lessee to develop there can be no application of the doctrine of "ordinary care" on the part of the lessee where the lease expressly imposed upon the lessee the obligation to continuously operate the wells.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686. p. 690.

DECLARATION OF FORFEITURE—TENDER OF STIPULATED COMPENSATION.

An oil and gas lease provided that the lessee should pay quarterly in advance a specified sum as compensation in lieu of drilling within the succeeding quarter. The lessee paid and the lessor accepted the quarterly payments in lieu of drilling for a period of 16 years. Under such circumstances the lessor can not declare and enforce a forfeiture for a failure to drill where he made no demand and gave

no notice to the lessee to develop the land at the time of the acceptance of the last quarterly payment, and a declaration of forfeiture for such cause will excuse the failure of the lessee, who continued to tender the stipulated compensation thereafter, to exercise the right to enter and drill wells while the lessor evinces an intention to treat the lease as forfeited.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

INTEREST OF LESSOR—FORFEITURE.

An oil and gas lease in the first instance usually grants to the lessee merely the right to explore for oil and gas, but if the exploration and development is made in accordance with the terms of the lease, and oil or gas is produced thereby as provided by the lease, the lessee acquires an interest in the land. And when an interest in real estate has thus been acquired by a lessee it will not be forfeited unless it clearly appears that it would be against equity to permit the lessee to longer assert such interest.

Rembarger v. Losch (Ind. App.), 118 Northeastern 829, p. 833.

FAILURE TO PAY ROYALTIES—FORFEITURE OR CANCELLATION.

To entitle a lessor of an oil and gas lease to equitable relief by way of forfeiture or cancellation of a lease after the lessee's failure to make the stipulated payments, it must appear that there is not an adequate remedy at law by a suit for damages; and the burden is upon the complainant, the lessor, to establish an absence of such remedy when relief is sought in equity.

Rembarger v. Losch (Ind. App.), 118 Northeastern 829, p. 833.

FORFEITURE—WAIVER.

A person entitled to the forfeiture of an oil lease and the consequent right of reentry may waive such right or be estopped by his own conduct from asserting the right. And any fact properly evidencing the intention of a lessor to waive any right of forfeiture is admissible in an action by an assignee of the lessor to forfeit the lease.

Munsey v. Marnet Oil & Gas Co. (Texas Civ. App.), 199 Southwestern 686, p. 690.

FAILURE TO DRILL—FORFEITURE—WAIVER BY LESSOR.

The lessor in an oil and gas lease providing that in lieu of drilling the lessee may pay quarterly in advance a specified sum as compensation in lieu of drilling in the succeeding quarter, can not, after accepting the quarterly advance payments during a period of 16

years without protest or demand to drill at the end of the last quarter for which he accepted compensation in lieu of drilling, declare an immediate termination and forfeiture of the lease because of delay in performing the covenant to drill.

Johnson v. Armstrong (West Virginia), 94 Southeastern 753, p. 755.

ACCEPTANCE OF RENTALS—FORFEITURE—ESTOPPEL.

The owner of land, by an oil and gas lease, sold to the lessee all the oil and gas under certain described lands. The lessee was to pay one-eighth of the oil produced and \$200 per annum for gas, and drilling was to commence within one year and be prosecuted with due diligence. The lessee might prevent a forfeiture by paying to the lessor a certain stated amount per quarter for three years, but the commencement of a well should operate as full liquidation for all rentals. That payments were made, and subsequently a well at large expense was drilled, but the gas was not sufficient to market. That thereafter the lessee made two annual payments and tendered a third, which the lessor refused to accept on the ground that the lease was no longer in effect. Under these circumstances the acceptance of the payments for rent, the failure of the lessor to declare the lease ended and save the lessee from the useless expenditure of a large sum for drilling the gas well, and the acceptance of the annual compensation for his share of the gas produced had the effect of lulling the lessee into the belief that his dereliction in punctually carrying out the lease had been condoned; and neither the lessor nor his heirs can recall such acts to the prejudice of the lessee, and they are estopped from attacking the validity of the lease.

Dellinger v. Smith, 142 Louisiana, 77 Southern 947.

FRAUD—CANCELLATION.

An oil and gas lease may be declared invalid and fraudulent and canceled on the ground of fraud where it was procured by the lessee falsely and fraudently misrepresenting to the complaining tenant in common that the other tenants in common had leased the land to him for oil and gas purposes, and by fraudently presenting to the complainant a pretended lease executed by the other tenants in common and by falsely representing that the other tenants in common had in fact executed the lease for their interest in the land, when in truth and in fact no such lease had been executed, and that the pretended lease was in fact false and was invented by the lessee for the purpose of deceiving and inducing the complainant to execute a lease covering her interest in the land.

Dieterle v. Harris (Oklahoma), 160 Pacific 873, p. 874.

INDIAN LANDS—APPROVAL OF LEASE.

A full-blooded Creek citizen executed an oil and gas lease upon his allotted land and the lease was filed in the office of the United States Indian agent, Union Agency, Muskogee, Indian Territory. The Indian lessor died before its approval by the Secretary of the Interior, and the heirs of the lessor thereafter conveyed the leased land by deed duly approved by the county court, after which the lease was approved by the Secretary of the Interior. The approval relates back to the date of the lease, and the grantors in the deed by the heirs of the Indian lessor took their title subject to the lease.

Scioto Oil Co. v. O'Hern (Oklahoma), 169 Pacific 483, p. 485.

WRITTEN LEASE—APPROVAL BY SECRETARY.

The act of April 26, 1906 (34 Stats., 145), requires that all leases and rental contracts except leases and rental contracts for not exceeding one year for agricultural purposes for lands other than homesteads of full-blooded allottees of the Choctaw, Chickasaw, Cherokee, Creek, and Seminole tribes shall be in writing and shall be subject to approval by the Secretary of the Interior. Under this act an Indian oil lease can have no validity without the Secretary's approval. The protection of the Indian's right is left to the Indian Bureau, of which the Secretary is the head, and the court may only interfere to protect the rights of others when they are invaded by clearly unauthorized action. The approval rests in the exercise of the Secretary's discretion. This authority was given to him for the protection of Indians against their own improvidence and the designs of those who would obtain their property for inadequate compensation. The law gives the Secretary the power to consider the advantages and disadvantages of the lease presented for his action, and to grant or withhold approval as his judgment may dictate. Such a lease has no validity without the Secretary's approval.

Anlicker v. Gunsburg, 38 Supreme Ct. Rep. 228, p. 230.

LEASE OF INDIAN LANDS—APPROVED BY MISTAKE OF LAW—TRUST.

A lessee in an oil and gas lease given by a Creek Indian filed a bill in equity for relief and to charge the defendant oil company as trustee upon the theory that the lease to the defendant company had been approved by the Secretary of the Interior by mistake of law; and that, but for the mistake, the lease of the complainant would have been approved, and for such reason the defendant oil company is a trustee for the complainant and should be required to assign the lease to him. To maintain the action the complainant must establish not

only that the action of the Secretary was wrong in approving the other lease but that the complainant was himself entitled to an approval of his lease and that it was refused to him because of an erroneous ruling of law by the Secretary.

Anlicker v. Gunsburg, 38 Supreme Ct. Rep. 228, p. 229.

UNAPPROVED INDIAN LEASE NOT ENFORCEABLE.

A lessee in an oil and gas lease of the lands of a Creek Indian can not enforce such lease in any court or claim any rights thereunder where it has not been approved by the Secretary of the Interior and where another lease of the same land to other lessees is shown to have had the approval of the Secretary.

Anlicker v. Gunsburg, 37 Supreme Ct. Rep. 228, p. 230.

MINING PROPERTIES.

TAXATION.

CONSTRUCTION OF CONSTITUTION.

The constitution of Utah limits taxation of mines and mining property to the net proceeds derived from any mine; but this does not mean that there are no net proceeds in fact unless there are proceeds in excess of the cost of producing them. The language is that the "annual" net proceeds shall be taxed and not the net proceeds that may be derived from the mining venture when considered as a whole. The constitution further provides that the "net annual proceeds" from all mines and mining claims shall be taxed as provided by law. The statute enacted pursuant to this provision must be construed in the light of the constitutional provisions and a statute may limit the costs and expenses to be deducted to the particular year in which the proceeds are assessed for taxation.

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78, p. 79.

CONSTITUTIONAL PROVISION—NATURE OF MINING PROPERTY.

The purpose of section 3, Article XII, of the constitution of Montana, was to provide a special method for the assessment and taxation of mining property. The making of the special provision shows that the convention was of the opinion that this species of property, though falling generally within the definition of "property," could not be justly dealt with by the method provided for other real property, and therefore must be valued and taxed by a method which would accomplish this result. The theory adopted is that it should be regarded as a mixed quality, real as to surface value and personality as to the subsurface contents thereof.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 55.

CONSTITUTIONAL PROVISION FOR TAXATION OF MINES.

The constitution of Montana (Art. XII, sec. 3) provides that all mines and mining claims, whether placer or rock in place containing gold, silver, copper, lead, coal, or other valuable mineral deposits after purchase from the United States shall be taxed at the price paid therefor.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 55.

CONSTITUTIONAL PROVISIONS—NOT SELF-EXECUTING.

The constitutional provisions of Utah relating to the taxation of mines and mining claims and the net annual proceeds of mines are not self-executing, but laws have been enacted and amended from time to time supplementing these constitutional provisions.

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

MINING PROPERTY—TAXATION OF SURFACE.

The constitution of Montana (Art. XII, sec. 3) and the constitution of Utah (Art. XIII, sec. 4) provide for the taxation of mining property and provide also that in case the surface ground, or any part thereof, is used for other than mining purposes, it shall be taxed at its value for such other purposes. In the estimation of the constitutional conventions the surface would have no value except when it would be in condition to produce profit and that such other value as it might derive from its use as residential, manufacturing, and agricultural purposes must be ascertained as if it were real estate and added to the purchase price of the claim.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 55.
Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

TAXATION OF MINING MACHINERY—SURFACE IMPROVEMENTS.

The constitution of Montana (Art. XII, sec. 3) and the constitution of Utah (Art. XIII, sec. 4) provide that all machinery used in mining and all property and surface improvements upon or appurtenant to mines or mining claims that have a value separate and independent of such mines or mining claims should be valued and taxed as improvements upon other property are, and the valuation and assessment are to be ascertained under the provisions of law applicable to other real property.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 55.
Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

TAXATION OF ANNUAL NET PROCEEDS OF MINES.

The constitution of Montana (Art. XII, sec. 3) and the constitution of Utah (Art. XIII, sec. 4) provide for the taxation of the annual net proceeds of all mines and mining claims. Provision was made for the taxation of the claim itself on the basis of the purchase price, taxation of the surface under certain circumstances, and taxation of mining machinery and surface improvements. As to the subsurface contents of the mine, the theory was adopted by the constitutional conventions that these should be regarded as having no

taxable value other than so far as they might add to the resources of the owner by the yielding of a profit. This clause was added which in effect makes an exemption of the contents of a mine from taxation so long as they should not prove a source of profit by being extracted and converted into personal property. This necessitates the devising a method of ascertaining the net profits and a mode by which their taxable value might be ascertained.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 55.
Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

CONSTRUCTION OF STATUTE—NET PROCEEDS.

The statute of Utah providing for the taxation of the net annual proceeds of a mine does not concern itself with costs or deficits that arise in any year except those incurred during the year in which the net proceeds are obtained. It is not a question whether or not the mine owner or operator gains net proceeds or net profits from his mine when considered as a business venture, but as applied to taxation the question is: Did the mine or mining property yield net proceeds for the particular year in which the assessment is made? It makes no difference whether the ores are obtained from the mine or a dump, if in fact they were at some time taken from the mine. A mine operator may lose money for a period of years, but if there is any one year in which the yield of the mine exceeds the deductions allowed by the statute the excess is subject to assessment and taxation as net proceeds for that year.

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78, p. 79.

NET ANNUAL PROCEEDS—METHOD OF REACHING.

A mining corporation conceded that its net proceeds for the year 1913 amounted in round numbers to \$43,000, with which sum it was assessed for taxation. The mining company insisted that for the purpose of determining the net proceeds of the mine it had the right to show that from 1876 to 1890 it developed in operating its mine certain ores which were then of too low a grade to be profitably reduced and shipped but were placed in a dump, and in 1913, by a cheaper process of reducing ores, these low-grade ores were shipped and reduced at the profit stated; that it was entitled as against the alleged net proceeds of 1913 to show that the cost of mining the low-grade ores and placing them in the dump during the long period of time would more than counterbalance the apparent profit received from the ores in 1913, and that therefore there were no net proceeds to be assessed for that year. It is manifest that under the Utah statute, for the purpose of taxing the net proceeds of a mine, the cost

of mining incurred in any one year must be considered independently from the cost and expense incurred in any other year, and that only such costs and expenses as are incurred during the year in which the net proceeds are obtained may be considered.

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78, p. 79.

TAXATION OF PROCEEDS OF MINE—MEANING AND APPLICATION OF
“MINE.”

The constitution of Montana (Art. XII, sec. 3) and the constitution of Utah (Art. XIII, sec. 4) provide for the taxation of mines and mining claims purchased from the United States at the price paid therefor. Under certain circumstances the surface of such claims and the mining machinery and surface improvements are to be taxed separately. These sections also provide “and the annual net proceeds of all mines and mining claims shall be taxed as provided by law.” The expression “all mines,” as used in this clause was intended by the constitutional conventions to apply to all mineral deposits and put them in the category of personal property and the margin over and above the cost of extraction only, to be taxed at a value to be ascertained by visual inspection or mathematical calculation. The expression is broad enough to include all mines, both those found in lands purchased from the United States under the mining laws and those obtained by grant or purchased under other laws. There is no reason to suppose that the convention gave careful attention exclusively to mines and mining claims purchased as such from the United States, omitting all consideration of those acquired by other modes. The convention knew that grants of land held by the Northern Pacific Railway Company included coal and iron. They knew that lands acquired by settlers under the homestead law and other laws were possibly underlaid with minerals. It is reasonable to suppose that by the use of the general language in this last clause the convention intended to include all mineral deposits and to declare that their taxable value should be their productive value after development. It is more reasonable also to conclude that the convention intended to classify mines as such rather than that it intended to classify them with reference to the law by which title was acquired. The term “mine” as used in the last clause of this section was not intended to be limited to the mines or mining claims purchased from the United States and the taxation of the net proceeds “of all mines” applies to mines wherever found or worked, without reference as to how the title to the land in which it is found has been acquired.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 56.

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

PURPOSE OF CONSTITUTIONAL PROVISION—DIFFICULTY IN MAKING VALUATION OF PROPERTY.

The provisions of Article XII of the constitution of Montana, including section 3 with reference to the taxation of mines and mining property, are designed to aid, not to prevent, the raising of public revenues. The mineral estate reserved as separate and distinct from the surface constitutes property with a value, taxable because not exempted, and the difficulty which might confront a taxing officer in ascertaining the value is no bar to the taxation of the mineral estate.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 53.

ASSESSMENT OF COAL LANDS.

The constitution of Utah (Art. XIII, sec. 4) provides that coal lands purchased from the United States shall be assessed at the price paid therefor. Sections 2 and 3 of the same article provide for the assessment of other property which includes coal lands not purchased from the Government at its actual value. These provisions are carried into the statutes (Compiled Laws of Utah, 1907, secs. 2504-2506). It is not a compliance with these constitutional and statutory requirements for an assessing officer to make a blanket assessment at a flat or uniform rate of all coal lands in any county of the State. It is a fact of which the courts take judicial notice that the coal lands purchased from the United States were not purchased at a uniform price per acre, and that the coal lands purchased from the State are not of uniform value. The assessment of all such lands at a uniform rate per acre is a flagrant disregard of the plain provisions of both the constitution and the statute.

Ririe v. Randolph County Assessor (Utah), 169 Pacific 941, p. 942.

RETURN OF PROPERTY FOR ASSESSMENT.

The statute of Utah (Laws, 1907, sec. 2566) and the amendment of 1909 require that all persons engaged in mining in that State must at a specified time in each year make certain statements under oath to the State board of equalization showing both the gross and net yield from their mines for the preceding year.

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

ASSESSMENTS FOR TAXATION—DEDUCTION OF EXPENDITURES.

The statute of Utah (Compiled Laws, 1907, secs. 2566, 2567, and 2568) requires all persons engaged in mining to make a statement under oath of the gross and the net yield from their mines for the preceding year. The statement must contain a true and correct

account of the actual expenditures of money and labor in extracting the ore, transporting the same to the reduction works, the reduction of the ore and conversion of the same into money during the year. In this statement of expenditures there must be allowed all money expended for necessary labor, machinery, and supplies used in the mining operations, for the improvements necessary in the workings of the mine, for reducing the ore, or for construction of mills and reduction works, for transporting the ore, and for extracting the metals and minerals therefrom; but only the money invested in the mines or improvements during the year immediately preceding the statement must be included therein. The expenditures shall not include salaries or sums paid to any person or officers not actually engaged in the working of the mine or personally superintending its management. The expenses that are permitted to be deducted from the gross yield are such only as were incurred during the year for which the proceeds are taxed. The statute leaves no room for construction respecting the time in which the expenses may be deducted from the gross yield of any mine in order to arrive at the net proceeds that are subject to assessment and taxation for any particular year. "The money invested in the mines or improvements during any year except the year immediately preceding such statement must not be included therein."

Mammoth Mining Co. v. Juab County (Utah), 170 Pacific 78.

SEPARATE ASSESSMENT OF OIL—ADDING TO THE AGRICULTURAL VALUE.

The addition to the agricultural value of the mineral value of land assessed based upon the quantity of oil produced is not a separate assessment of the mineral oil.

Palmer Co. v. Police Jury, etc., 142 Louisiana, 78 Southern 122, p. 123.

OIL LANDS—AGRICULTURAL AND MINERAL VALUATION.

The owner of valuable oil-producing lands furnished the assessor a statement showing only the agricultural value of the land, knowing it to be insignificant in comparison with the mineral value of the land. Such owner is estopped from complaining that the board of supervisors or board of review had to adjourn the meeting subject to call to allow the assessor an opportunity to obtain information which the landowner himself should have furnished regarding the mineral value of the land and in reassembling without notice to the landowner, especially where the owner does not contend that his lands were worth less than the amount of the assessments and where the evidence shows that they were worth much more.

Palmer Co. v. Police Jury, etc., 142 Louisiana, 78 Southern 122, p. 123.

MINING RIGHT—ASSESSMENT.

A conveyance of the right to mine, excavate, or remove coal underlying a tract of land is a conveyance of an interest in the land, and such a mining right is real estate to be assessed for taxation separately from the other part of the land.

Simmons Coal Co. v. Board of Review, etc. (Illinois), 118 Northeastern 753, p. 754.

LEASE OF RIGHT TO MINE COAL.

The revised statutes of Illinois (Hurd Rev. Stats. 1915-16, ch. 94) provide that any mining right, or the right to dig for or obtain iron, lead, copper, coal, or other minerals from land, may be conveyed by deed or lease, and when the owner of any land shall convey by deed or lease any mining right therein, such conveyance shall be considered as so separating such right from the land that the same shall be taxable separately and any sale of the land for any tax or assessment shall not include or affect any such mining right.

Simmons Coal Co. v. Board of Review, etc. (Illinois), 118 Northeastern 753, p. 754.

CONVEYANCE OF SURFACE—RESERVATION OF MINERALS—VALUATION.

Where mineral land has been conveyed and the grantor reserved all the minerals and also the use of such surface ground as may be necessary for the exploring for and mining or otherwise extracting the minerals, the cash value of the land, omitting the deposit of mineral from the estimate, is to be ascertained for the purpose of taxation as if the entire estate was vested in the grantee and an equitable apportionment of this value made by the assessor between grantee and the grantor.

Northern Pacific R. Co. v. Musselshell County (Montana), 169 Pacific 53, p. 57.

TAX ON MINING CORPORATIONS—TIME OF LEVY.

The statute of New Jersey providing for the taxation of certain corporations (act April, 1884, P. L., p. 232), contains no express declaration as to the beginning or ending of the annual period which the tax is to cover. The tax is in the nature of a compensation to be paid by corporations for the enjoyment of their corporate privileges during an annual period. Neither the supplement of March 17, 1892 (P. L., p. 126), nor the supplement of February 19, 1901 (P. L., p. 31), fixes a definite date nor changes the date fixed by the original statute of 1884, and as that act went into effect on April 18, the import is that the 18th day of April of each year marks the beginning

of the yearly period for which the corporation fee or tax is charged. Under this rule a corporation can not be prevented from making a voluntary dissolution on March 19, 1917, on the ground that the taxes for that year remain unpaid.

Old Dominion Copper Mining & Smelting Co. v. State Board of Taxes and Assessments (New Jersey), 103 Atlantic 79, p. 80.

TAXATION ON COAL LANDS—MANDAMUS TO COMPEL OFFICER TO ACT.

A taxing officer who has violated the plain provisions of the constitution and of the statute in making assessments and valuations of coal lands can not be compelled by mandamus to properly assess such lands after the assessments have been completed, the taxes equalized, the rate established, the funds apportioned, and the assessment roll has passed entirely beyond the control of the taxing officer.

Ririe v. Randolph County Assessor (Utah), 169 Pacific 941, p. 942.

ISSUANCE OF TAX DEED—INJUNCTION.

An injunction may be granted to restrain the issuance of a deed to the purchaser at a tax sale of minerals reserved on the sale and conveyance of the surface of certain lands, where no mine had been opened or operated and where there had been no net proceeds from any mine upon the land, but the assessment of the mineral reservation had been made at a certain arbitrary sum per acre. An injunction is not to be denied on the ground that the owner of the mineral has not paid or offered to pay the part of the tax that was legal where the legal and the illegal portions can not be separated and the legal part can not be ascertained and paid.

Northern Pacific Railroad Co. v. Musselshell County (Montana), 169 Pacific 53, p. 57.

QUARRY OPERATIONS.

NEGLIGENCE OF OPERATOR—INCOMPETENCY OF FOREMAN.

An experienced powder man in a granite quarry set off a blast in three holes in a sheet of granite. By the blast the stone was separated from the quarry to some extent, leaving a seam between the solid wall and the stone intended to be removed. After the blast the foreman examined the result and ordered the powder man to make a seam blast. While the powder man was engaged in making the seam blast and inspecting the tamping and the powder to see if the exploder was all right the stone, being on an incline or slope, moved and the powder exploded, causing the injuries complained of. The complainant alleged the negligence of the operator in not furnishing him with a safe place in which to perform his duties and in not furnishing him with a competent fellow servant. The proof shows that the foreman had worked for the operator for a long time and had never been guilty of negligence or incompetency before, and there was nothing tending to show any circumstances in connection with the alleged negligent act in failing to make proper inspection from which it could be inferred that the foreman was incompetent, and in such state of the evidence it was error to submit the question of the foreman's incompetency to the jury as it confused the real issue in the case.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 493, p. 495.

OPERATOR'S KNOWLEDGE OF DANGEROUS CONDITION—NEGLIGENT ORDER TO EMPLOYEE.

If by an inspection made by a foreman in a quarry the operator knew, or in the exercise of due care ought to have known of the dangerous condition existing, and then ordered an employee to make a seam blast, the employee not having knowledge of such dangerous condition equally with the operator, the operator is liable for injuries resulting to the employee.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 493, p. 495.

NEGLIGENCE OF FOREMAN—FELLOW SERVANT RULE NOT APPLICABLE.

A foreman in a quarry was acting as and for the operator in making an inspection of the quarry after a blast and in giving an order to a powder man to make a seam blast. In such case the foreman is not a fellow servant of the powder man and the fellow-servant rule is not involved.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 493, p. 495.

DUTY OF OPERATOR TO INSPECT—QUESTION OF FACT.

By a blast in a stone quarry the stone was separated from the quarry to some extent, leaving a seam between the solid wall and the stone intended to be removed. After the blast was fired the quarry foreman went to the place of the blast, examined the result of the blast, and ordered an employee to make a seam blast, and to hurry, as the men were waiting for it. The foreman inspected the situation, and on such inspection gave the order to make the blast. Under the circumstances it was a question of fact for the jury whether, under proper instructions by the court, it did not devolve upon the operator to make a reasonable inspection of the situation before ordering the second blast.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 493, p. 495.

DUTY OF OPERATOR TO INSPECT—ASSUMPTION OF DUTY PERFORMED.

Where it is the duty of a quarry operator to inspect the condition after a blast in the quarry, an employee is justified, in the absence of knowledge or information to the contrary, in assuming that the operator has performed his duty fully in this regard and to rely upon it without inspecting for himself.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 493, p. 495.

DUTY OF EMPLOYER—RISKS NOT ASSUMED BY EMPLOYEE.

An employee in a quarry does not assume the risk until after the operator has exercised ordinary care to furnish him a reasonably safe place and safe appliances in which and with which to work. An employee does not assume risks until the employer has used reasonable care to avoid them.

Pringle v. Carthage Quarry Co. (Mo. App.), 199 Southwestern 561, p. 563.

ASSUMPTION OF RISK—PLEADING AND PROOF.

In an action for the death of an employee while working in the line of his employment in a quarry, the employer may prove the defense of assumption of risk under the general denial.

Pringle v. Carthage Quarry Co. (Mo. App.), 199 Southwestern 561, p. 562.

RISKS NOT ASSUMED.

An employee in a quarry did not assume a danger that was created by the act of his employer in exploding dynamite which the employer knew was likely to throw rocks to the place where the employee was killed, when the employer knew of the employee's position.

Pringle v. Carthage Quarry Co. (Mo. App.), 199 Southwestern 561, p. 563.

DANGEROUS CONDITION—DUTY TO WARN EMPLOYEE.

An employee acting as a powder man in a quarry has a right to depend upon the operator, he being present by his agent, a foreman, directing the work, and the powder man has the right to presume that the operator, through his agent or foreman, would warn and save him from needless exposure to injury.

Barclay v. Wetmore-Morse Granite Co. (Vermont), 102 Atlantic 493, p. 495.

INJURY TO EMPLOYEE—OPPORTUNITY TO REACH PLACE OF SAFETY.

In an action for the death of an employee in a quarry caused by his being struck by rock thrown by an explosion, if the shot was fired when the employee was driving his team with his back to the shot or before he had time to make observations for his safety after he stopped his team and the foreman knew where the employee was at the time the shot was fired, then the question as to whether the quarry operator gave the employee sufficient time to reach a place of safety was comprehended within the issue submitted as to whether the operator knew, or by the exercise of ordinary care could have known, that the employee was likely to be struck by rocks thrown by the explosion.

Pringle v. Carthage Quarry Co. (Mo. App.), 199 Southwestern 561, p. 562.

WILLFUL OPERATIONS—LIABILITY.

A landowner brought an action against a railroad company for damages arising out of blasting operations conducted by the railroad company in its quarry near the lands of the complainant. Under the pleadings it was proper to instruct the jury to find for the plaintiff if from the evidence they concluded that the conduct of the railroad company in carrying on its blasting operations was done willfully and wantonly.

Cobb v. Atlantic Coast Line Ry. Co. (North Carolina), 95 Southeastern 92, p. 93.

DAMAGES FOR INJURIES TO MINERS.

ELEMENTS OF DAMAGES.

EARNING CAPACITY—ABSENCE OF WAGE SCALE.

A coal miner was injured while employed by a coal mine operator to push from the pit mouth to the tippie the loaded cars as they came from the mine below to the tippie. He was paid a wage of \$2 per day for the particular service; but as a miner he could earn at mining from \$6 to \$8 a day and according to his testimony he intended to resume the work of mining but for a temporary suspension in the mine his work as a miner would have continued. His testimony as to what wages he could earn if employed as a miner was not proper where there was nothing to show the general wage scale for miners, or that the injured miner was distinguished by superior capacity over the ordinary miner.

Clark v. Butler Junction Coal Co. (Pennsylvania), 102 Atlantic 952, p. 953.

RECOVERY BY MINOR.

In an action by a boy 14 years of age injured while working in a mine, it is proper for the court to instruct the jury to the effect that in fixing his damages they might consider his ability to earn money and livelihood after he arrived at the age of 21, but that the jury would not be authorized to assess any damages in his favor on account of anything he might be able to earn before he arrived at the age of 21.

Vandalia Coal Co. v. Butler (Ind. App.), 119 Northeastern 34, p. 38.

EXPECTANCY OF BOY.

In an action for damages by a boy 14 years of age employed in a mine it is proper to admit evidence showing what the expectancy of a boy of 14 years of age is.

Vandalia Coal Co. v. Butler (Ind. App.), 119 Northeastern 34, p. 38.

DAMAGES FOR LOSS OF TIME—PLEADING.

In an action by an injured miner for damages no damages for loss of time can be assessed unless specially pleaded.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern 792, p. 793.

EXPENSE OF MEDICAL ATTENTION—CROSS EXAMINATION.

In an action by a miner for injuries, he testified that he first consulted a physician who simply advised the use of a rubber supporter, but gave no other evidence as to medical advice. The complainant having testified as to the extent and character of his injuries, the pain and suffering he endured, the defendant had a right on cross-examination to get from him the fullest particulars both as to what he did and what he failed to do to obtain relief and improvement.

Clark v. Butler Junction Coal Co. (Pennsylvania), 102 Atlantic 952, p. 954.

MATTERS PROPERLY CONSIDERED IN ESTIMATING DAMAGES.

In an action by a miner for damages for injuries sustained while engaged in working as an independent contractor, the court in its instructions properly confined the finding of the jury to the evidence in the case and the amount of damages to such as they would deem "a reasonable compensation" for the injury sustained. The court also properly instructed the jury as against assessing any damages as a punishment of the defendant.

Benoit Coal Mining Co. v. Faught (Alabama), 77 Southern 695, p. 696.

WITNESS IMPROPERLY INFLUENCED.

Where it appears to a court that a witness for the plaintiff in an action by a miner for damages for injuries had been improperly influenced to testify as he did, it is not only the right but it is the duty of the court to order a retrial of the case.

Fuginiti v. Diamond Coal & Coke Co. (Pennsylvania), 103 Atlantic 51.

FRAUD IN PROCURING SETTLEMENT—SUBSEQUENT SUIT—REFUNDING CONSIDERATION.

A miner was injured while in the course of his employment in the operation of a mining machine by compressed air by reason of an excessive quantity of air being turned into the branch pipe that supplied air for his machine without his knowledge, thereby blowing gravel and débris in his face and destroying one eye and injuring the other. Shortly after the injury and before the miner knew the extent of the injury and that one eye was destroyed the physician of the mine operator, an eye specialist, represented to the miner that his eye would be as good as ever in two or three weeks and that he would fix him up all right, and thereupon the injured miner was induced by an agent of the mine operator to execute a release and settlement for his injuries in consideration of the payment of \$84. The mine operator paid the physician employed by him \$69. At

the time the release was signed the plaintiff did not know that his eye was destroyed, but the doctor and the agent who procured the release did know that the sight of one eye was wholly destroyed. On learning the condition of his eye and the fraud practiced in obtaining the release and settlement the miner could maintain an action for damages for the injuries by tendering back to the mine operator the \$84 received by him, but he was not required to return or offer to return the \$69 paid by the mine operator to the physician.

Loveless v. Cunard Mining Co. (Mo. App.), 201 Southwestern 375, p. 378.

DAMAGES NOT EXCESSIVE.

INSTANCES.

A judgment for \$6,000 is not excessive where a miner received an injury that caused the removal of one eye and compelled him to wear an artificial eye; that the injury caused considerable pain and suffering and required him to undergo the operation of removing the eye.

Loveless v. Cunard Mining Co. (Mo. App.), 201 Southwestern 375, p. 379.

A verdict and judgment for \$1,200 for suffering and pain from a flesh wound with no permanent injury shown was not adjudged excessive where the judgment was reversed on other grounds.

Borderland Coal Co. v. Edwards (Kentucky), 199 Southwestern, 792, p. 793.

A verdict and judgment for \$400 is not excessive for injuries to a miner caused by a fall of rock from the roof where the miner's leg was broken below the knee in more than one place and he was permanently crippled.

Carter Fuel Co. v. Fillpeck (Kentucky), 201 Southwestern 468, p. 469.

INTERSTATE COMMERCE.

POWER OF STATE TO CONTROL PUBLIC UTILITIES.

When the principle that a State can control public utilities doing business within its boundaries clashes with the principle that a State may not directly impose a burden on interstate commerce, then the principle that a State may not directly interfere with interstate commerce must prevail rather than the principle that the State under all circumstances must have the fullest control over public utilities doing business within its borders.

Landon v. Public Utilities Commission, 245 Federal 950, p. 954.

JURISDICTION OF PUBLIC UTILITIES COMMISSION.

The statute of Illinois (Laws 1913, p. 460, Art. IV, sec. 52) provides that in case of insufficiency of cars at any time to meet all requirements such cars as are available shall be distributed among the several applicants therefor in proportion to their respective immediate requirements without discrimination. The Public Utilities Commission of Illinois under this statute is without jurisdiction to determine whether a rule of a railroad company for the distribution of coal cars was unjust or unreasonable.

State Public Utilities Commission v. Baltimore, etc., R. Co. (Illinois), 118 Northeastern 81, p. 84.

REVIEW OF ORDER OF PUBLIC SERVICE COMMISSION.

An order of the Public Service Commission setting aside a regulation of a railroad company classifying shippers for the purpose of distributing coal cars for shipment on occasion of an imminent shortage in such cars is reviewable by the courts on the question of the reasonableness of the regulation and the character of the discrimination it makes.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 546.

AUTHORITY OF PUBLIC SERVICE COMMISSION—DISTRIBUTION OF COAL CARS.

The Public Service Commission of West Virginia may set aside an unreasonable and unjust regulation made by a railroad company and establish a reasonable and just one in lieu thereof, but this is the extent of the authority conferred by the statute. And authority to annul unreasonable, unjust, and discriminatory regulations and substitute reasonable and just measures for them is not authority to disturb them when they are reasonable, just, and legal. The differ-

ence in the method of loading cars employed by tippie mines whereby open top and hopper cars are loaded quickly, and the method employed by team track loading mines in loading cars from wagons by the hand shovel, occupying a great length of time, together with the difference in the relative volume of coal shipped by each, constitutes a basis for the classification made by a railroad company and is not unjust or unreasonable discrimination and is one with which the Public Service Commission has no authority to interfere or overrule.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 548.

RULE OF RAILROAD COMPANY FOR DISTRIBUTION OF COAL CARS—BASIS AND VALIDITY.

The Baltimore & Ohio Railroad Company, in the matter of its supply of coal cars to mine operators in West Virginia, adopted and entered a rule under which it furnished to team track loading mines—that is, to mine operators engaged in loading coal from wagons and motor trucks—box cars exclusively for intrastate shipments and commerce, and furnished to tippie loaders—that is, operators engaged in loading coal into railroad cars from tipples or other like structures—for intrastate shipment, open top, gondola, or hopper cars. On application the Public Service Commission of West Virginia entered an order requiring the railroad company to cease and desist from this practice and to furnish the team track loading mines for intrastate shipments and commerce the same per cent of open top, gondola or hopper cars to which they were entitled under their allotment as it furnished to tippie loaders. The rule adopted and acted upon by the railroad company was based upon the difference in the method of loading cars and was reasonable and one that the railroad company was justified in adopting and acting upon. The order of the Public Service Commission in requiring the railroad company to cease and desist from its distribution of coal cars to the different classes of mine operators was not within the authority of the Commission to make under the statute of West Virginia, and it was within the jurisdiction of a court to declare the order of the commission invalid.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 548.

POWER OF STATE TO CONTROL DISTRIBUTION OF COAL CARS.

Neither a State statute nor a State public utilities commission has power or jurisdiction to establish a rule for the distribution of coal cars by a railroad company to coal mine operators or to determine whether a rule of the railroad company, engaged in interstate commerce, for the distribution of coal cars to operators is unfair or

whether the rule unjustly discriminates against one class of shippers in favor of another, as that is within the administrative power of the Interstate Commerce Commission.

State Public Utilities Commission v. Baltimore, etc., R. Co. (Illinois), 118 Northeastern 81, p. 84.

DISTRIBUTION OF COAL CARS—REGULATION BY STATE.

The statute of Illinois (Hurd Rev. Stats., 1915-16, chap. 114, sec. 84) requires railroad corporations to furnish cars within a reasonable time for the transportation of property furnished for such transportation. This statute does not impose a direct burden upon interstate commerce, as it only requires a railroad company to furnish cars within a reasonable time after demand; and under the statute a railroad company may be liable for a failure to furnish cars at a coal mine within a reasonable time after the same were required for the transportation of coal.

State Public Utilities Commission v. Baltimore, etc., R. Co. (Illinois), 118 Northeastern 81, p. 82.

DISTRIBUTION OF CARS—CONSTRUCTION OF STATUTE.

The West Virginia statute (Code 1916, ch. 54, sec. 66c) provides that a railroad company along whose line the industry of mining coal is carried on shall without discrimination and without unnecessary delay make a reasonable provision for all coal offered for transportation and shall not discriminate in rates, distribution of cars, or otherwise against or among shippers of coal. The legislation was invoked to prevent discrimination between persons and corporations engaged in the industry and operating mines properly equipped for loading coal to compel reasonable provision for transportation of the coal from such mines. The statute deals with mining industries and requires impartial provision of facilities for them, but it can not be fairly interpreted as requiring equal facilities to persons not regularly engaged in the coal mining nor having the usual and ordinary equipment for mining coal. Its purpose was to promote and encourage efficient coal mining and transportation and not to embarrass or hamper them.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 547.

DISTRIBUTION OF COAL CARS—LIABILITY OF RAILROAD COMPANY.

A railroad company engaged in the performance of interstate commerce may be liable in damages in an action in a State court for failure to furnish a coal company with cars to which it was entitled under a rule established and promulgated by the railroad company. The liability in such case is not based on the ground that the rule of the carrier was unfair, unreasonable, discriminatory, or preferential,

but the liability must arise by reason of the carrier's failure to furnish cars according to its own rule.

State Public Utilities Commission v. Baltimore, etc., R. Co. (Illinois), 118 Northeastern, 81, p. 84.

ALLOTMENT OF COAL CARS—CARS FURNISHED ON SIDINGS.

The Public Service Commission of West Virginia is authorized to enter and enforce an order to the effect that the Baltimore & Ohio Railroad Company is not required to furnish team track loaders with cars of any character upon private sidings connected with its railroad, unless such sidings are owned by the team track loaders, or unless the team track loaders obtain the consent of the owners thereof to use such siding.

Baltimore & Ohio Railroad Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 549.

ALLOTMENT OF CARS FOR COAL SHIPMENTS—OPEN-TOP AND BOX CARS.

Where there is a great shortage of cars suitable for coal shipments, this shortage being occasioned by extraordinary conditions bringing into temporary activity a great many mines that are not equipped with tipples for loading cars, and such mines demand pro rata allotments to them of open-top cars for their shipments, and these cars can not be furnished without serious detriment to permanent and properly equipped mines, to the railroad, and to the general public, a railroad company of which such allotment and distribution are demanded may, by promulgation of a regulation applicable to all such mines, assign and allot its open-top cars to the permanent and properly equipped mines and its box cars to those loading without tipples and loading from wagons and trucks. Such a regulation made under such circumstances is neither unreasonable nor unjustly discriminatory.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 546.

CLASSIFICATION OF MINES—DISTRIBUTION OF OPEN AND CLOSED CARS.

The fact that perhaps 95 per cent of the operating coal mines are equipped with tipples and other means of quick loading into open coal cars, and the remaining 5 per cent are team track loading mines without any equipment or facilities for loading and load from wagons with ordinary hand shovels holding the cars while in process of loading for an unusual length of time, constitutes a sufficient basis for a classification made by a railroad company and justifies the Public Service Commission in upholding the classification. Under such a classification the railroad company may supply to the mines permanently equipped with tipples and equal loading facilities the open-top coal cars and hopper cars that can be loaded in a few minutes, and may supply to the team track loading mines box cars or other

covered cars to be loaded from wagons with hand shovels, although the box cars can not be loaded in this method as rapidly as could the open cars.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 548.

LOADING CARS FROM WAGONS—CLASSIFICATION OF CARS.

Cars placed on side tracks for team loading generally consume the entire day and longer, and necessarily these have to be shifted before loading is completed, in the use of sidings for other purposes, all of which involves loss of time to shippers in the handling of cars for team loading. These facts prove that the operation of team track-loading mines retards and limits transportation of coal to the detriment of properly equipped mines and carriers and the general public, and justifies the assignment of box cars for such purposes as these can be used more advantageously and with less inconvenience at sidetracks in the open country than at tippie mines. Such a classification is founded upon real and substantial differences and puts each class of cars in that branch of transportation in which it can be most efficiently employed, though denying the team track loaders the more convenient and desirable class.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 72.

TEAM TRACK LOADING MINES—DEMAND FOR EQUAL CAR SERVICE DENIED.

Team track loading mines are not equipped for the production and shipment of coal in a manner in which the business is usually conducted. Their methods do not harmonize or correspond with existing and firmly established conditions and they do not contemplate the usual equipment for loading and shipping. For these reasons and because of the delay in the manner of loading them they can not demand as a right under the public service act of West Virginia service and facilities in all respects equal to those afforded properly equipped mines having an established and permanent business. Equal service in the supply of cars involves a disarrangement and impairment of a complex system upon which the efficient operations and functions of two or three great industries vital to the public welfare depend, and the compliance with a demand for equal shipment and convenience in the assignment of cars would involve the introduction of chaotic conditions in mining, transportation, manufacturing, and domestic life. The demand is a means of obtaining mere personal and individual gains as the operators of these team track loading mines embarrass rather than aid the efforts to meet the public demand for coal. Both the carrier and the public utilities commission are justified on refusing the same facilities to this class of operators as are furnished to

mines regularly and permanently equipped for quick loading and rapid transportation.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 547.

TEAM TRACK LOADING—"SNOW BIRD" MINES—DISTRIBUTION OF CARS.

Until recently the team track loading mines constituted a negligible quantity in the mining and shipment of coal, but the demand and high prices for coal has brought many of these mines into existence, each producing only small quantities and a small per cent of the total shipments of coal. Under normal conditions they could not profitably operate and when such conditions are restored their production will doubtless cease, and for these reasons they have been denominated "snow bird" mines or shippers. Ordinarily they do not load more than one car a day and add nothing to the available supply of coal as the regularly equipped mines can produce more than carriers can transport. Less than 60 per cent of the cars demanded for coal transportation can now be supplied on account of the shortage of cars.

Baltimore & Ohio R. Co. v. Public Service Commission (West Virginia), 94 Southeastern 545, p. 547.

TRANSPORTATION OF NATURAL GAS—POWER OF STATE TO REGULATE RATES.

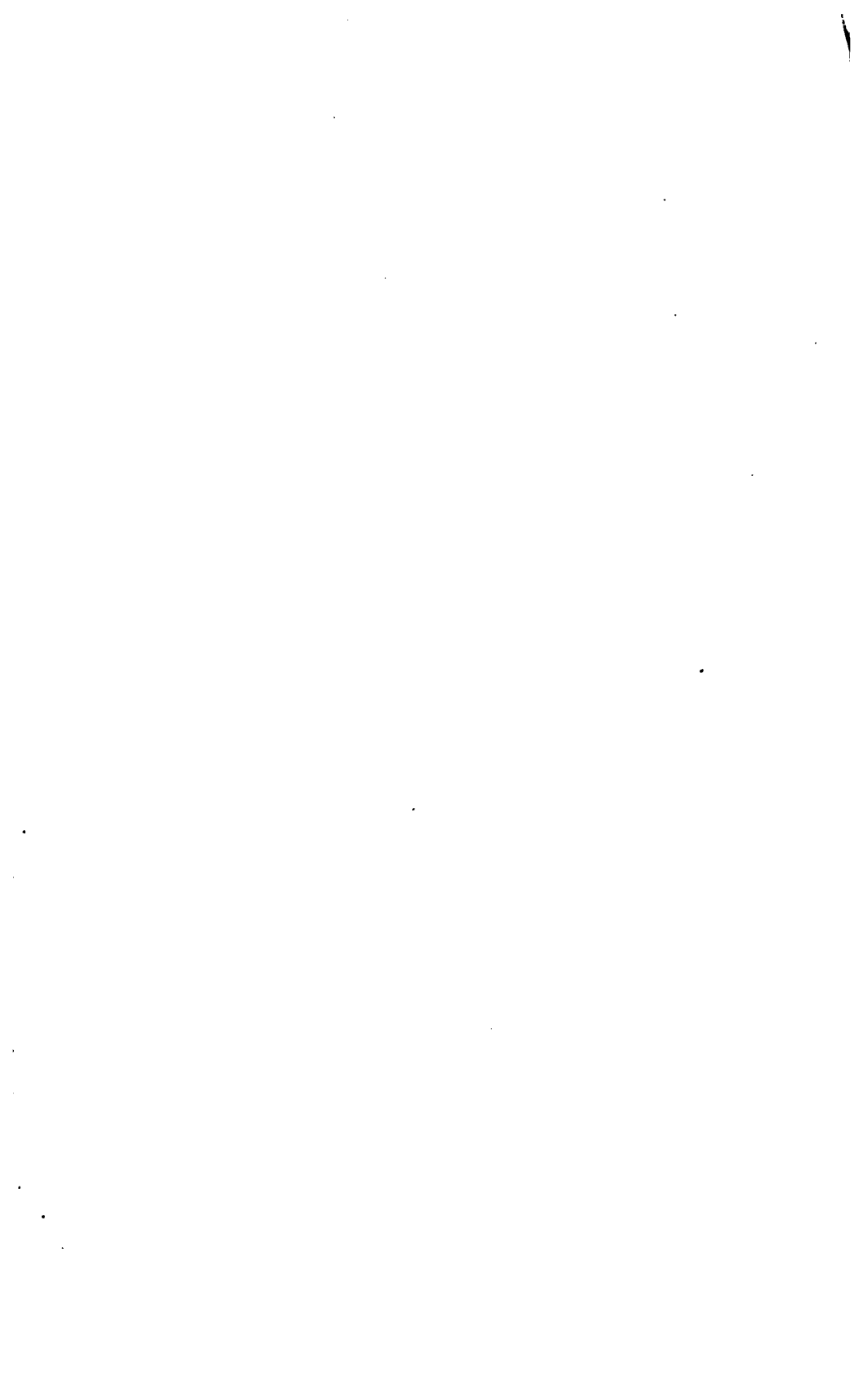
The Public Service Commission of Missouri has no power to suspend schedule rates agreed upon by the receiver of an interstate pipe line transporting natural gas and the distributing companies in the State of Missouri and has no power to establish a new rate for natural gas in cities in the State of Missouri as such acts constitute an attempt to directly interfere with and directly burden interstate commerce and constitutes the taking of property without due process of law.

Landon v. Public Utilities Commission, 245 Federal 950, p. 954.

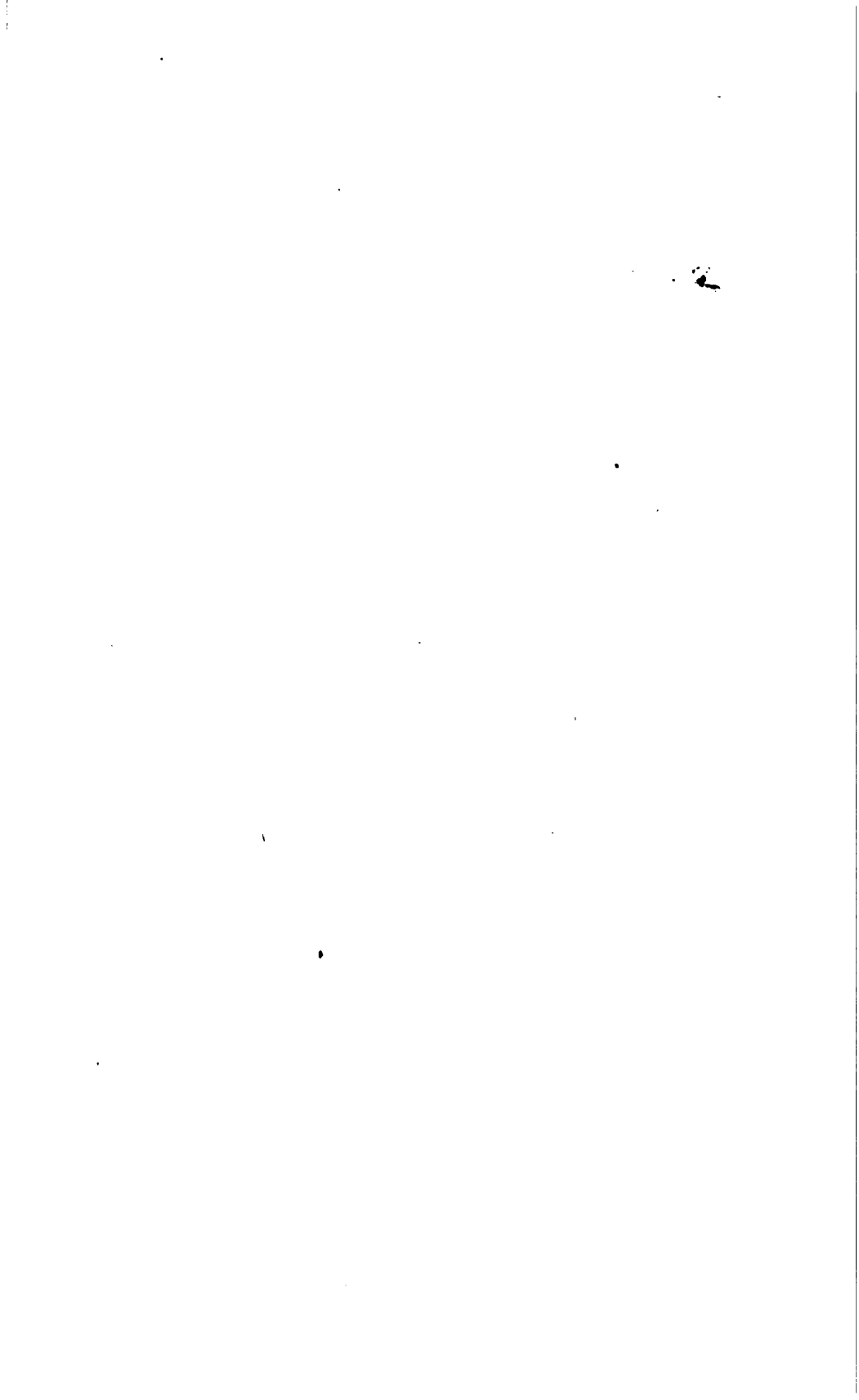
NATURAL GAS—STORING AND TRANSPORTATION.

The transportation of natural gas from Oklahoma and sale thereof in the State of Missouri constitutes interstate commerce. This status is not changed by the fact that provisions were made for the storage of the gas as that was merely incidental to the transportation and was in fact a necessary incident to the proper and efficient transportation of the gas, and as such storage is merely incidental, it does not change the character of the business from interstate to intrastate commerce.

Landon v. Public Utilities Commission, 245 Federal 950, p. 952.







DUE DATE

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6B BULLETIN
0800 US BUREAU OF
MINES

v-30 NO-168-172

DATE	ISSUED TO
OCT 01 1980	John Womack Jr
MAY 25 1980	Renew (M)
SEP 21 1980	RENEW
JAN 25 1991	RENEW
MAY 24 1991	Renew
SEP 08 1991	RE
JAN 24 1992	
AUG 21 1992	
JAN 29 1993	
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